

CIVIL ENGINEERING REPORT DEVELOPMENT APPLICATION SSD 10366

PROPOSED BUNNINGS FACILITY LOT 3, BRINGELLY ROAD HORNINGSEA PARK

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1 INTRODUCTION

1.1 Introduction

Bunnings Group proposes to develop a warehouse facility for Bunnings over Lot 3 Bringelly Road, Horningsea Park, NSW.

The proposed development over the site is for a single-level warehouse building, bagged goods canopy, timber trade sales, building materials and landscape yard, office space, truck loading and circulation areas and passenger vehicle parking.

1.2 Scope

Costin Roe Consulting Pty Ltd has been commissioned by Bunnings to prepare this Engineering Report in support of the proposed Development Application for the site.

This report provides a summary of the design principles and planning objectives for the following civil engineering components of the project:

- Earthworks
- Stormwater Management; and
- Erosion & Sediment Controls.

The engineering objectives for the development are to complete the alternations and additions, based on the proposed architectural layout, and to provide an appropriate and economical stormwater management system which incorporates best practice in water sensitive urban design and is consistent with the requirements of council's water quality objectives.

This report also specifically addresses Condition B15 of SSD_6324 (dated 13 January 2016) which states "*Future development applications for construction of buildings shall include a Stormwater Management Plan in accordance with the Civil and Engineering report prepared by Northrop, dated November 2014 and Councils Development Control Plan 2008 and Liverpool City Council Growth Centre Precincts Development Control Plan*". Further the report and design has been completed with consideration to the NSW Department of Planning & Environment SEARS dated 30 August 2019.

It should be noted that drawings developed for this report are conceptual only, and not a detailed design. Details provided are subject to adjustment as the design is developed to completion.

Further it is noted that a separate Early Works Development Application for earthworks and retaining wall construction is to be submitted to Liverpool Council by the developer of the Bringelly Business Hub (ESR and Charter Hall). This application covers early works for the site consisting of earthworks and wall construction to facilitate the construction of the proposed Bunnings Warehouse development. The documentation prepared for this application is consistent with levels and earthworks designs produced in the Early Works Application Documentation also completed by Costin Roe Consulting.

1.3 Authority Jurisdiction

The development, being part of the Bringelly Road Business Hub, as approved under SSD_6324, will be assessed by the NSW Department of Planning and Environment. The department issued SEARS specific to this development under SSD_10366 dated 30 August 2019 (Refer **Appendix C**) and this document considers the requirements of the SEARS and agency responses.

It is noted that as the site is located within the bounds of Liverpool City Council local government area that the requirements of the Liverpool City Council *Development Design Specification D1 through D9* will be considered in the design of facility.

2 DEVELOPMENT SITE

2.1 Location

The proposed development is located in the suburb of Horningsea Park within the proposed Bringelly Road Business Hub at Lot 3, Bringelly Road as shown in **Figure 2.1**.



Figure 2.1. Locality Map (Source: Near Maps 2019)

2.2 Existing Site Description

The Bringelly Road Business Hub Estate is currently located on an undeveloped parcel of land. The proposed early works industrial facility occupies a land area of 4.1 Ha located on Lot 3 at the eastern end of the Bringelly Road Business Hub Estate. The site is bounded by Stuart Road to the north and west, Lot 4 of the proposed Bringelly Road Business Hub to the east, and Bringelly Road and Skyline Crescent to the south.

The site is currently undergoing cut to fill earthworks as part of the SSD_6324 approval. Following completion of these works the site will drain to the waterway on the north of the site at grades of 1-2%. Runoff from the site currently flows from a high point on the south-western boundary of the site.

The site is also subject to a proposed early works application for earthworks and retaining walls. These works are proposed to create a flat pad for the building, grading through parking areas, and to increase the levels between those approved under SSD_6324 and proposed level for the building construction.

Access to the site will be available from the under-construction Skyline Crescent at two locations.

2.3 Proposed Development

The proposed development is for the construction of a single level warehouse for Bunning's Warehouse. The indicative layout for the development produced by Michael Carr Architect Pty. Ltd. has been included in **Figure 2.2**.

The proposed warehouse comprises a large single level warehouse building situated centrally on the eastern boundary. A building materials & landscape yard and timber trade sales is to the north of the warehouse. A bagged goods canopy and outdoor nursery is to the south with ancillary office space on the southern portion of the building. Truck loading areas and circulation hardstand is located around the perimeter of the building as well as fire access. Parking is to the west of the building.

Civil works will include minor earthworks, stormwater drainage and pavements.

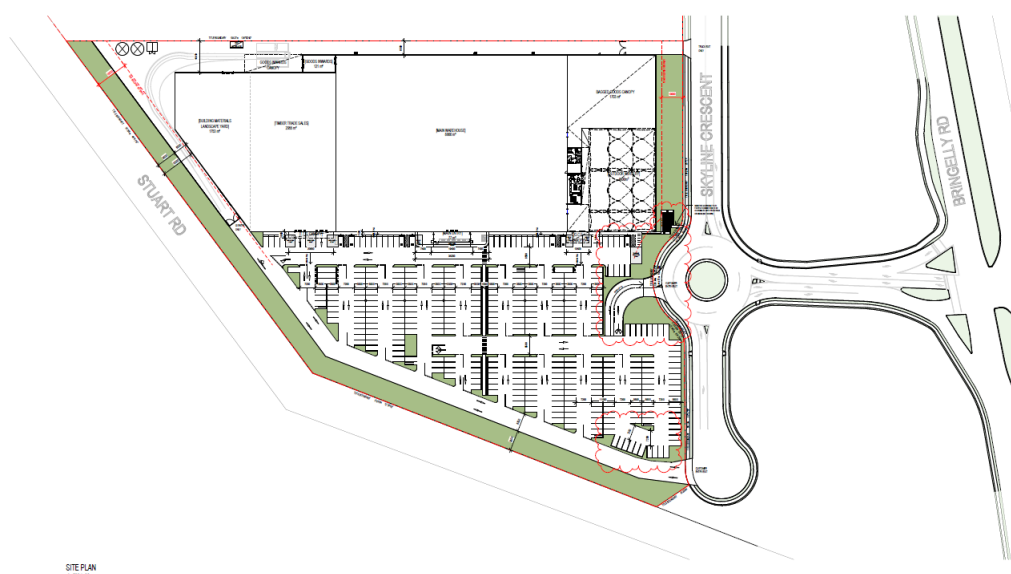


Figure 2.2. Proposed Development Layout

2.4 SEARS Items

The design considers the requirements of NSW Planning Industry & Environment SSD_10366 SEARS dated 30 August 2019 (refer **Appendix C**). In particular this document covers requirements of *Soil & Water* as included in the *Key Issues* section of the SEARS document. We further provide the following response and direction to the relevant sections of the report for each of the *Soil and Water* items. Refer **Table 2.1** below.

<i>Item</i>	
<i>Item 1</i>	<i>A description of water demands of the development and a breakdown of water supplies</i> <u>Response</u> Refer Section 6.4 for discussion on rainwater reuse, external and not-potable uses and harvesting. Refer EIS for discussion on internal uses and water saving measures and demands.
<i>Item 2</i>	<i>Identify any water licensing requirements under the Water Act 1912 of Water Management Act 2000</i> <u>Response</u> The project does require any water licensing and does not have any relevance to the either of the acts listed above.
<i>Item 3</i>	<i>Details of proposed erosion and sediment controls during construction.</i> <u>Response</u> Refer Section 7 of this report and associated drawings Co11994.06-DA20 and DA25 for details of Erosion and Sediment Controls.
<i>Item 4</i>	<i>Detailed plans and a description of the surface and stormwater management system, including on-site detention, design in accordance with Water Sensitive Urban Design Principles</i> <u>Response</u> Refer Sections 4, 5 and 6 of this report and associated drawings Co11994.06-DA41, DA42, DA45 and DA46 for detailed information of the proposed drainage layout and management systems. The stormwater management strategy (including stormwater detention, water quality and rainwater reuse requirements) has been completed in accordance with the overall estate strategy as defined and approved under SSD_6324 and condition B15 of SSD_6324.
<i>Item 4</i>	<i>An assessment of flooding impacts</i> <u>Response</u> The site achieves suitable flood immunity and the proposed development does not impact existing flooding to the north of the site. Refer Section 4.4 of this report, and approved Northrop consulting Engineering Report under SSD_6324.

Item 5	<i>An assessment of potential impacts (including from potential spillage of materials) on surface and groundwater resources, drainage patterns, soil (stability, salinity and acid sulfate soils), related infrastructure, watercourse and riparian land and proposed mitigation measures.</i> <u>Response</u> There are no dangerous goods proposed for the site. Refer to Section 6 of this report in relation to proposed water quality measures, provided in accordance with approved SSD_6324 estate strategy
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Table 2.1 SEARS Response Items

3 SITE WORKS

3.1 Earthworks

As noted earlier, a separate Early Works Development Application has recently been submitted on the property for earthworks and retaining wall construction by ESR/ Charter Hall. This submission was completed in conjunction with design documentation by Costin Roe Consulting with coordination with the Bunnings Facility designs. The current application includes consideration to the design for the Early Works Application (to Liverpool Council) and the majority of earthworks would be performed under the separate early works approval prior to the building works taking place.

Earthworks as depicted in this application will be limited to minor trimming of the provided earthwork pads to incorporate the architectural layout and drainage requirements of the site.

Soil Erosion and Sediment Control measures including sedimentation basins are to be placed in accordance with submitted drawings and the Soil and Water Management Plan in **Section 7** of this report.

3.2 Embankment Stability

To assist in maintaining embankment stability, slopes of permanent batters will be no steeper than 3 horizontal to 1 vertical while temporary batters will be no steeper than 2 horizontal to 1 vertical.

Permanent batters will also be adequately vegetated or turfed which will assist in maintaining embankment stability.

Stability of batters and reinstatement of vegetation shall be in accordance with the submitted drawings and the Soil and Water Management Plan in **Section 7**.

3.3 Supervision of Earthworks

All geotechnical testing and inspections performed during the earthworks operations will be undertaken to Level 1 geotechnical control, in accordance with AS3798-1996.

4 STORMWATER MANAGEMENT

4.1 Hydrology

4.1.1 General Design Principles

The design of the stormwater system for this site will be based on relevant national design guidelines, Australian Standard Codes of Practice, Liverpool City Council Development Control Plan and accepted engineering practice.

Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code Part 3 – Stormwater Drainage.

Overall site runoff and stormwater management will generally be designed in accordance with the Institution of Engineers, Australia publication “Australian Rainfall and Runoff” (1987 Edition), Volumes 1 and 2 (AR&R).

4.1.2 Minor/ Major System Design

The piped stormwater drainage (minor) system has been designed to accommodate the 20-year ARI storm event (Q20). Overland flow paths (major) which will convey all stormwater runoff up to and including the Q100 event (to the provided OSD tanks) have also been provided which will limit major property damage and any risk to the public in the event of a piped system failure.

4.1.3 Rainfall Data

Rainfall Intensity Frequency Duration (IFD) data used as a basis for DRAINS modelling for the 5 to 100 year ARI events, was taken from The Bureau of Meteorology Online IFD Tool.

4.1.4 Runoff Models

The calculation of the runoff from storms of the design ARI will be calculated with the catchment modelling software DRAINS using council nominated IFD data.

The design parameters for the DRAINS model are to be based on typical parameters for the area and are as follows:

Model	Model for Design and analysis run	Rational method	
	Rational Method Procedure	ARR87	
	Soil Type-Normal	3.0	
	Paved (Impervious) Area Depression Storage	1	mm
	Supplementary Area Depression Storage	1	mm
	Grassed (Pervious) Area Depression Storage	5	mm
AMC	Antecedent Moisture Condition (ARI=1-5 years)	2.5	
AMC	Antecedent Moisture Condition (ARI=10-20 years)	3.0	
AMC	Antecedent Moisture Condition (ARI=50-100 years)	3.5	
	Sag Pit Blocking Factor (Minor Systems)	0	
	On Grade Pit Blocking Factor (Minor Systems)	0	
	Sag Pit Blocking Factor (Major Systems)	0.5	
	On Grade Pit Blocking Factor (Major Systems)	0.2	
	Inlet Pit Capacity		

Table 4.1: DRAINS Parameters

4.2 Hydraulics

4.2.1 General Requirements

Hydraulic calculations will be carried out utilising DRAINS modelling software during the detail design stage to ensure that all surface and subsurface drainage systems perform to or exceed the required standard.

4.2.2 Freeboard

The calculated water surface level in open junctions of the piped stormwater system will not exceed a freeboard level of 150mm below the finished ground level, for the peak runoff from the Major System runoff. Where the pipes and junctions are sealed, this freeboard would not be required.

The calculated water surface for the peak runoff from the Major System runoff will not exceed a freeboard level of 300mm below the finished floor level of the building.

4.2.3 Public Safety

For all areas subject to pedestrian traffic, the product (dV) of the depth of flow d (in metres) and the velocity of flow V (in metres per second) will be limited to 0.4, for all storms up to the 100-year ARI.

For other areas, the dV product will be limited to 0.6 for stability of vehicular traffic (whether parked or in motion) for all storms up to the 100-year ARI.

4.2.4 Inlet Pit Spacing

The spacing of inlets throughout the site will be such that the depth of flow, for the Major System design storm runoff, will not exceed the top of the kerb (150mm above gutter invert).

4.2.5 Overland Flow

The piped system has been designed to convey all storms up to and including the 20-year ARI. Dedicated flow paths have been shown which will convey stormwater from the site to OSD systems and in the event of full system blockage to the existing waterway to the north.

4.3 **Site Drainage**

4.3.1 Existing Site Drainage

The property is currently undeveloped with no formal in-ground drainage located on site.

The 4.1 Ha catchment is drained to a Bringelly Road Business Hub Estate sediment basin located on the north eastern side of the property. Discharge from the site is made to the existing natural waterway also toward the north-east of the site.

4.3.2 Proposed Site Drainage

As per general engineering practice and the guidelines of LCC, the proposed stormwater drainage system for the development will comprise a minor and major system to safely and efficiently convey collected stormwater run-off from the development to the legal point of discharge.

The minor system is to consist of a piped drainage system which has been designed to accommodate the 1 in 20-year ARI storm event (Q20). This results in the piped system being able to convey all stormwater runoff up to and including the Q20 event. This meets the requirements of LCC and is the minimum recommended capacity for an industrial development.

The major system will be designed to cater for storms up to and including the 1 in 100-year ARI storm event (Q100). The major system will employ the use of defined overland flow paths, such as roads and open channels, to safely convey excess run-off from the site.

The design of the stormwater system for this site will be based on relevant national design guidelines, Australia Standard Codes of Practice, the standard of LCC and accepted engineering practice. Runoff from buildings will generally be designed in accordance with AS 3500.3 National Plumbing and Drainage Code part 3 – Stormwater Drainage. Overall site runoff and stormwater management

will generally be designed in accordance with the Institute of Engineers, Australia publication “Australian Rainfall and Runoff” (1988 Edition), Volumes 1 and 2 (ARR).

Stormwater Management is required to be provided for water quantity and quality in accordance with the requirements of LCC DCP. Further discussion on the Stormwater Management Strategy is provided in **Section 5** and **6** of this report. Reference to drawings **CO11994.06-DA41 & DA42** shows the proposed drainage layout. The stormwater management strategy has been completed with consideration to the estate management strategy as defined by Northrop Consulting Engineers as part of SSD_6324.

4.3.3 Proposed Site Discharge

Discharge from the site is proposed at on the north-western corner of the property boundary, via a 675mm diameter RCP inter-allotment drainage line. This inter-allotment drainage line is then discharged via a headwall to the existing Bedwell Park Wetland to the north, as per estate management strategy as defined by Northrop Consulting Engineers as part of SSD_6324.

4.4 **Flooding**

Liverpool City Council’s ePlanning portal demonstrates that the Bedwell Park Wetlands area has no risk of flooding as seen in **Figure 4.1** below.

Flood requirements for the estate, and current Steel Force facility, have been assessed and approved as part of the SSD_6324 approval. As described in *Section 5.3* of the approved engineering report by Northrop Consulting (November 2014), with the proposed works are clear of any flood affected areas and with the provision of on-site detention measures, the proposed development will not affect flows or flooding within Bedwell Park Wetland. A short summary of the findings of the approved report and figures is included for reference.

Bewsher Consulting had carried out flooding assessment and prepared a flood management plan for Council in 2011. The Bedwell Park Wetland, downstream of the development site (refer to **Figure 4.2** for location) is discussed in this plan as follows:

- Pond A contains permanent water storage and flows through to Pond B downstream via two (2) 825mm diameter pipes and overflows at RL53.1m AHD
- Pond B discharges to an open channel downstream via a piped drainage system and has a spillway level at RL51.2m AHD
- Flood modelling results indicate that water levels in Ponds A and B increase to RL53.20m AHD and RL51.58m AHD respectively in the 1% AEP flood.

The Probable Maximum Flood (PMF) is conservatively estimated to be at RL53.50m AHD, 300mm above the top water level at RL53.20m. Taking into account the effects of climate change and applying a conservative increase of 500mm in flood levels and adopting 500mm of freeboard to the PMF, building pads and buildings would need to be set at a minimum level at RL54.50m.

The proposed building level is 76.00m. This has a clearance of more than 10m to the predicted PMF flood levels, hence flood immunity is provided to the building.

Local overland flows from pavement runoff etc have been accounted for within the building design as described in other sections of the report.

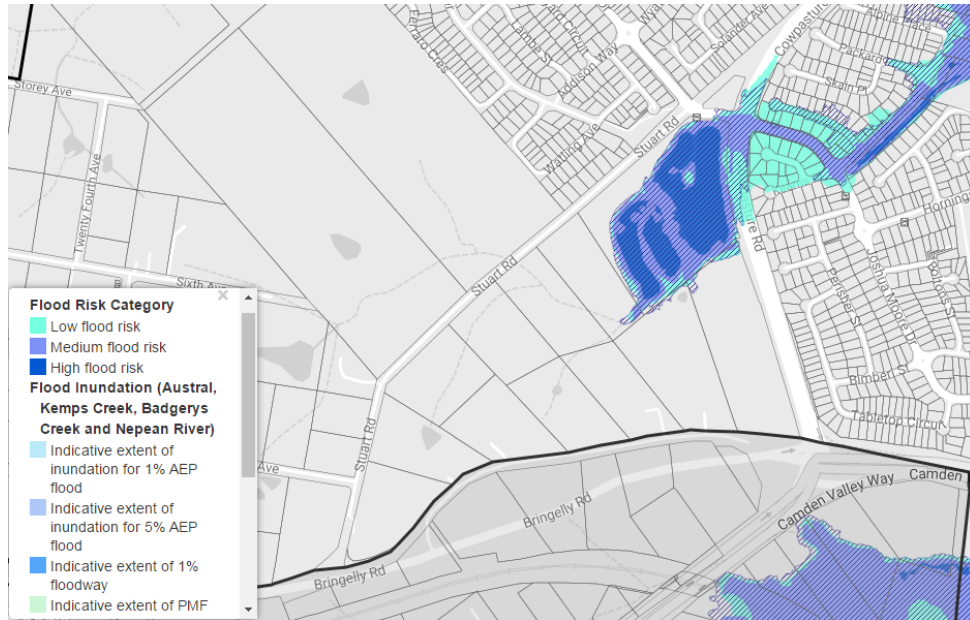


Figure 4.1 Flood risk (Source: Liverpool City Council, ePlanning Portal)



Figure 4.2 Bedwell Park Wetland (Source: Nearmap 2017)

5 STORMWATER QUANTITY MANAGEMENT

Liverpool City Council requires water quantity management, or stormwater detention, to be provided to limit the runoff discharged from private property into the underground piped drainage system to pre-developed flow and to assist in mitigating the increased stormwater runoff generated by development.

Attenuation of stormwater runoff from the catchment on the development is proposed to be managed via an on-site detention tank provided in the north-west of the site. As set out in the estate management strategy as defined by Northrop Consulting Engineers as part of SSD_6324, the objective for stormwater discharge is to attenuate stormwater flow from the development to pre-developed flows, consistent with Liverpool City Council policy and engineering practice.

Sizing of the basin system has been completed using DRAINS modelling software in accordance with the Liverpool City Council Policy for the 1 in 5 year ARI to 1 in 100 year ARI storms for various durations.

Table 5.1 provides details for the pre and post development flows and storage for the total detention system. The critical storm duration for the 1 in 5 year, 1 in 20 year and for the 1 in 100 year ARI storms are 2 hours. Flows and storage information are provided for these storms.

ARI	Pre-developed Flow (m ³ /s)	Post-developed Flow (m ³ /s)	
		Un-attenuated	Attenuated
5	0.849	1.090	0.699
20	1.390	1.570	0.827
100	1.810	2.100	1.489

Table 5.1. Site and Detention Hydrology

The indicative location of the detention tank can be found on Drawing **Co11994.06-DA42**.

Indicative hydrological and storage arrangements are shown below, **Table 5.2**.

ARI	Post Developed Flow (m³/s)					Storage (m³)
	Un-attenuated	Attenuated				
		Low Flow	High Flow	Bypass	Total	
5	1.090	0.699	--	0	0.699	470
20	1.570	0.827	--	0	0.827	680
100	2.100	0.904	0.585	0	1.489	820

Table 5.2. OSD Tank Storage and Flow Arrangement

The modelling has shown that, with the provision of a total storage volume of 820m³ contained in the modelled system, stormwater flows from the development will be attenuated to pre-development flows. Detention storage will be fully active and will be provided as an OSD tank in the north of the property. The proposed detention system meets the policy requirements of Liverpool City Council.

6 STORMWATER QUALITY CONTROLS

6.1 Regional Parameters

There is a need to provide design which incorporates the principles of Water Sensitive Urban Design (WSUD) and to target pollutants that are present in the stormwater so as to minimise the adverse impact these pollutants could have on receiving waters and to also meet the requirements specified by the Liverpool City Council.

Liverpool City Council have nominated, in *Section 6.4* of their *DCP 2008 & MUSIC Link*, the requirements for stormwater quality to be performed on a catchment wide basis. These are presented in terms of annual percentage pollutant reductions on a developed catchment and are as follows:

Gross Pollutants	90%
Total Suspended Solids	85%
Total Phosphorus	65%
Total Nitrogen	45%
Total Hydrocarbons	90%

6.2 Proposed Stormwater Treatment System

Stormwater Treatment Measures (STM's) are to be implemented in accordance with the Liverpool Council Policy and the strategy and measures outlined in the Bringelly Road Business Hub Engineering Report by Northrop Engineers (Ref:140089) approved under SSD_6324. The STM's are to be sized according to the new development area only.

The STM's for the development shall be based on a treatment train approach to ensure that all of the objectives above are met.

Components of the treatment train for the development are as follows:

- Primary treatment to parking, hardstand & roof areas is to be performed via an appropriately sized Gross Pollutant Trap (GPT) located on site. The proposed system is the Rocla CDS GPT or similar;
- Tertiary treatment is to be made off-lot, via the Bedwell Park Wetland located to the north-east of the estate. The Bedwell Park Wetland will provide treatment of nutrients and sediments as set out in the Northrop Report quoted above. Stormwater discharge to the Bedwell Park Wetland is via an inter-allotment drainage line and overland flow path to the north-east of the site.

6.3 Stormwater Harvesting

Stormwater harvesting refers to the collection of stormwater from the developments internal stormwater drainage system for re-use in non-potable applications. Stormwater from the stormwater drainage system can be classified as either rainwater where the flow is from roof areas or stormwater where the flow is from all areas of the development.

For the purposes of this development, we refer to a rainwater harvesting system, where benefits of collected stormwater from roof areas over a stormwater harvesting system can be made as rainwater is generally less polluted than stormwater drainage.

Rainwater harvesting is proposed for the development for re-use of non-potable applications. Internal uses include such applications as toilet flushing while external applications will be used for irrigation.

In general terms the rainwater harvesting systems will be in-line tanks for the collection and storage of rainwater. At times when the rainwater storage tank is full rainwater can pass through the tank and continue to be discharged via gravity into the stormwater drainage system. Rainwater from the storage tank will be pumped for distribution throughout the development in a dedicated non-potable water reticulation system.

Rainwater falling on roofs is soft, clear and generally low in microbial and chemical contamination. Any contamination of rainwater generally occurs during collection and storage. The use of simple and cost effective rainwater collection and treatment systems ensures reliable operation and water quality for non-potable use. The proposed rainwater treatment will be a first flush diverter in accordance with council engineering guidelines.

Indoor and outdoor water demand and rainwater tanks sizing will be based on individual site requirements. A nominal tank size of 105kL incorporated into the OSD tank in addition to a single 35kL tank for nursery irrigation reuse is proposed. These systems are subject to detailed analysis during construction certificate stage by the Hydraulic Engineering Consultant. The tanks will be located on site to best suit the development layout and servicing needs.

6.4 Maintenance and Monitoring

It is important that each component of the water quality treatment train is properly operated and maintained. In order to achieve the design treatment objectives, an indicative maintenance schedule has been prepared (refer to **Table 6.3** below) to assist in the effective operation and maintenance of the various water quality components.

Note that inspection frequency may vary depending on site specific attributes and rainfall patterns in the area. In addition to the below nominated frequency it is recommended that inspections are made following large storm events.

Table 6.3. Indicative Maintenance Schedule

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
SWALES/LANDSCAPED AREAS			
Check density of vegetation and ensure minimum height of 150mm is maintained. Check for any evidence of weed infestation	Six monthly	Maintenance Contractor	Replant and/or fertilise, weed and water in accordance with landscape consultant specifications
Inspect swale for excessive litter and sediment build up	Six monthly	Maintenance Contractor	Remove sediment and litter and dispose in accordance with local authorities' requirements.
Check for any evidence of channelisation and erosion	Six monthly/ After Major Storm	Maintenance Contractor	Reinstate eroded areas so that original, designed swale profile is maintained
Weed Infestation	Three Monthly	Maintenance Contractor	Remove any weed infestation ensuring all root ball of weed is removed. Replace with vegetation where required.
Inspect swale surface for erosion	Six Monthly	Maintenance Contractor	Replace top soil in eroded area and cover and secure with biodegradable fabric. Cut hole in fabric and revegetate.
OSD SYSTEM			
Check all items nominated for SWALES/ LANDSCAPED AREAS above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above	Refer to SWALES/ LANDSCAPED AREAS section above
Inspect and remove any blockage from orifice	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen to inspect orifice.
Inspect trash screen and clean	Six Monthly	Maintenance Contractor/ Owner	Remove grate and screen if required to clean it.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Inspect flap valve and remove any blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate. Ensure flap valve moves freely and remove any blockages or debris.
Inspect pit sump for damage or blockage.	Six Monthly	Maintenance Contractor/ Owner	Remove grate & screen. Remove sediment/ sludge build up and check orifice and flap valve is clear.
Inspect storage areas and remove debris/ mulch/ litter etc likely to block screens/ grates.	Six Monthly	Maintenance Contractor/ Owner	Remove debris and floatable materials.
Check attachment of orifice plate and screen to wall of pit	Annually	Maintenance Contractor	Remove grate and screen. Ensure plate or screen mounted securely, tighten fixings if required. Seal gaps if required.
Check orifice diameter is correct and retains sharp edge.	Five yearly	Maintenance Contractor	Compare diameter to design (see Work-as-Executed) and ensure edge is not pitted or damaged.
Check screen for corrosion	Annually	Maintenance Contractor	Remove grate and screen and examine for rust or corrosion, especially at corners or welds.
Inspect overflow weir and remove any blockage	Six monthly	Maintenance Contractor/ Owner	Ensure weir is free of blockage.
Inspect walls for cracks or spalling	Annually	Maintenance Contractor	Remove grate to inspect internal walls, repair as necessary.
Check step irons	Annually	Maintenance Contractor	Ensure fixings are secure and irons are free from corrosion.

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
INLET & JUNCTION PITS			
Inside of pits	Six Monthly	Maintenance Contractor	Remove grate and inspect internal walls and base, repair where required. Remove any collected sediment, debris, litter.
Outside of pits	Four Monthly/ After Major Storm	Maintenance Contractor	Clean grate of collected sediment, debris, litter and vegetation.
PROPRIETARY TREATMENT DEVICES (ROCLA CDS or Equiv.)			
Refer to Manufacturers Operation and Maintenance Manual	Annually	Maintenance Contractor	Refer to Manufacturers Operation and Maintenance Manual
STORMWATER SYSTEM			
General Inspection of complete stormwater drainage system	Bi-annually	Maintenance Contractor	Inspect all drainage structures noting any dilapidation in structures and carry out required repairs.

7 EROSION & SEDIMENT CONTROL PLAN

An erosion and sediment control plan (ESCP) is shown on drawings **Co11994.06-DA20 & DA25**. These are conceptual plans only providing sufficient detail to clearly show that the works can proceed without undue pollution to receiving waters. A detailed plan will be prepared once consent is given and before works start.

7.1 General Conditions

- The ESCP will be read in conjunction with the engineering plans, and any other plans or written instructions that may be issued in relation to development at the subject site.
- Contractors will ensure that all soil and water management works are undertaken as instructed in this specification and constructed following the guidelines stated in Landcom document *Managing Urban Stormwater, Soils and Construction (1998)* – *The Blue Book* and Liverpool City Council specifications.
- All subcontractors will be informed of their responsibilities in minimising the potential for soil erosion and pollution to down slope areas.

7.2 Land Disturbance

Where practicable, the soil erosion hazard on the site will be kept as low as possible and as recommended in **Table 7.1**

Land Use	Limitation	Comments
Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans.	All site workers will clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope), or similar materials.
Access areas	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones onsite. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries.
Remaining lands	Entry prohibited except for essential management works	

Table 7.1 Limitations to access

7.3 Erosion Control Conditions

- Clearly visible barrier fencing shall be installed as shown on the plan and elsewhere at the discretion of the site superintendent to ensure traffic control and prohibit unnecessary site disturbance. Vehicular access to the site shall be limited to only those essential for construction work and they shall enter the site only through the stabilised access points.
- Soil materials will be replaced in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils remain on the surface at the completion of works.
- Where practicable, schedule the construction program so that the time from starting land disturbance to stabilisation has a duration of less than six months.
- Notwithstanding this, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than 20 working days.
- Land recently established with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Further application of seed might be necessary later in areas of inadequate vegetation establishment.
- Where practical, foot and vehicular traffic will be kept away from all recently established areas
- Earth batters shall be constructed in accordance with the Geotechnical Engineers Report or with as low a gradient as practical but not steeper than:

2H:1V where slope length is less than 7 meters

2.5H:1V where slope length is between 7 and 10 meters

3H:1V where slope length is between 10 and 12 meters

4H:1V where slope length is between 12 and 18 meters

5H:1V where slope length is between 18 and 27 meters

6H:1V where slope length is greater than 27 meters

- All earthworks, including waterways/drains/spillways and their outlets, will be constructed to be stable in at least the design storm event.
- During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.

7.4 Pollution Control Conditions

- Stockpiles will not be located within 5 meters of hazard areas, including likely areas of high velocity flows such as waterways, paved areas and driveways.
- Sediment fences will:
 - Be installed where shown on the drawings, and elsewhere at the discretion of the site superintendent to contain the coarser sediment fraction (including aggregated fines) as near as possible to their source.

- Have a catchment area not exceeding 720 square meters, a storage depth (including both settling and settled zones) of at least 0.6 meters, and internal dimensions that provide maximum surface area for settling, and
- Provide a return of 1 meter upslope at intervals along the fence where catchment area exceeds 720 square meters, to limit discharge reaching each section to 10 litres/second in a maximum 20 year t_c discharge.
- Sediment removed from any trapping device will be disposed in locations where further erosion and consequent pollution to down slope lands and waterways will not occur.
- Water will be prevented from directly entering the permanent drainage system unless it is relatively sediment free (i.e. the catchment area has been permanently landscaped and/or likely sediment has been treated in an approved device). Nevertheless, stormwater inlets will be protected.
- Temporary soil and water management structures will be removed only after the lands they are protecting are stabilised.

7.5 Waste Management Conditions

Acceptable bind will be provided for any concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter. Clearance service will be provided at least weekly.

7.6 Site Inspection and Maintenance

A self-auditing program will be established based on a Check Sheet. A site inspection using the Check Sheet will be made by the site manager:

- At least weekly.
- Immediately before site closure.
- Immediately following rainfall events in excess of 5mm in any 24 hour period.

The self audit will include:

- Recording the condition of every sediment control device
- Recording maintenance requirements (if any) for each sediment control device
- Recording the volumes of sediment removed from sediment retention systems, where applicable
- Recording the site where sediment is disposed
- Forwarding a signed duplicate of the completed Check Sheet to the project manager/developer for their information

In addition, a suitably qualified person will be required to oversee the installation and maintenance of all soil and water management works on the site. The person shall be required to provide a short monthly written report. The responsible person will ensure that:

- The plan is being implemented correctly
- Repairs are undertaken as required
- Essential modifications are made to the plan if and when necessary
- The report shall carry a certificate that works have been carried out in accordance with the plan.

Waste bins will be emptied as necessary. Disposal of waste will be in a manner approved by the Site Superintendent.

Proper drainage will be maintained. To this end drains (including inlet and outlet works) will be checked to ensure that they are operating as intended, especially that,

No low points exist that can overtop in a large storm event

Areas of erosion are repaired (e.g. lined with a suitable material) and/or velocity of flow is reduced appropriately through construction of small check dams or installing additional diversion upslope.

Blockages are cleared (these might occur because of sediment pollution, sand/soil/spoil being deposited in or too close to them, breached by vehicle wheels, etc.).

Sand/soil/spoil materials placed closer than 2 meters from hazard areas will be removed. Such hazard areas include areas of high velocity water flows (e.g. waterways and gutters), paved areas and driveways.

Recently stabilised lands will be checked to ensure that erosion hazard has been effectively reduced. Any repairs will be initiated as appropriate.

Excessive vegetation growth will be controlled through mowing or slashing.

All sediment detention systems will be kept in good, working condition. In particular, attention will be given to:

- Recent works to ensure they have not resulted in diversion of sediment laden water away from them
- Degradable products to ensure they are replaced as required, and
- Sediment removal, to ensure the design capacity or less remains in the settling zone.

Any pollutants removed from sediment basins or litter traps will be disposed of in areas where further pollution to down slope lands and waterways should not occur.

Additional erosion and/or sediment control works will be constructed as necessary to ensure the desired protection is given to down slope lands and waterways, i.e. make ongoing changes to the plan where it proves inadequate in practice or is subjected to changes in conditions at the work site or elsewhere in the catchment.

Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site stabilised

Litter, debris and sediment will be removed from the gross pollutant traps and trash racks as required.

8 CONCLUSION

This *Civil Engineering Report* has been prepared to support the SSD_10366 development application for a proposed Bunning's Warehouse facility at Lot 3 in Bringelly Road Business Hub on Bringelly Road, Horningsea Park.

A civil engineering strategy for the site has been developed which provides a best fit solution within the constraints of the existing landform, structures and pavements, the proposed architectural layout and the Stormwater Management Strategy as defined by Northrop Consulting Engineers as part of SSD_6324 and SEAR's requirements of SSD_10366. The stormwater quality and quantity management strategy has been developed to reduce pollutant loads in stormwater leaving this site in accordance with engineering principles and council policy.

It is recommended that the management strategies mentioned in this report be incorporated into the future detailed design. Detailed design may result in changes to the concept however design criteria will be followed.

Appendix A

DRAWINGS BY COSTIN ROE CONSULTING

PROPOSED FACILITY

LOT 3, BRINGELLY ROAD, HORNINGSEA PARK, NSW 2171

CIVIL DRAWINGS FOR DEVELOPMENT APPLICATION

DRAWING LIST

DRAWING NO.	DRAWING TITLE
C011994.06-DA10	DRAWING LIST & GENERAL NOTES
C011994.06-DA20	EROSION AND SEDIMENT CONTROL PLAN
C011994.06-DA25	EROSION AND SEDIMENT CONTROL DETAILS
C011994.06-DA41	STORMWATER DRAINAGE PLAN - SHEET 1
C011994.06-DA42	STORMWATER DRAINAGE PLAN - SHEET 2
C011994.06-DA45	STORMWATER DRAINAGE DETAILS - SHEET 1
C011994.06-DA46	STORMWATER DRAINAGE DETAILS - SHEET 2
C011994.06-DA51	FINISHED LEVELS PLAN - SHEET 1
C011994.06-DA52	FINISHED LEVELS PLAN - SHEET 2

GENERAL NOTES:

- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT STANDARDS AUSTRALIA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
- ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE BUILDER ON SITE. ENGINEER'S DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS. ENGINEER'S DRAWINGS ISSUED IN ANY ELECTRONIC FORMAT MUST NOT BE USED FOR DIMENSIONAL SETOUT. REFER TO THE ARCHITECT'S DRAWINGS FOR ALL DIMENSIONAL SETOUT INFORMATION.
- DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE BUILDER TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
- UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
- ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH ACCEPTABLE SAFETY STANDARDS & APPROPRIATE SAFETY SIGNS SHALL BE INSTALLED AT ALL TIMES DURING THE PROGRESS OF THE JOB.
- DRAWING TO BE READ IN CONJUNCTION WITH ENGINEERING REPORT C011994.01-05.rpt

ELECTRONIC INFORMATION NOTES:

- THE ISSUED DRAWINGS IN HARD COPY OR PDF FORMAT TAKE PRECEDENCE OVER ANY ELECTRONICALLY ISSUED INFORMATION, LAYOUTS OR DESIGN MODELS.
- THE CONTRACTOR'S DIRECT AMENDMENT OR MANIPULATION OF THE DATA OR INFORMATION THAT MIGHT BE CONTAINED WITHIN AN ENGINEER-SUPPLIED DIGITAL TERRAIN MODEL AND ITS SUBSEQUENT USE TO UNDERTAKE THE WORKS WILL BE SOLELY AT THE DISCRETION OF AND THE RISK OF THE CONTRACTOR.
- THE CONTRACTOR IS REQUIRED TO HIGHLIGHT ANY DISCREPANCIES BETWEEN THE DIGITAL TERRAIN MODEL AND INFORMATION PROVIDED IN THE CONTRACT AND/OR DRAWINGS AND IS REQUIRED TO SEEK CLARIFICATION FROM THE SUPERINTENDENT.
- THE ENGINEER WILL NOT BE LIABLE OR RESPONSIBLE FOR THE POSSIBLE ON-GOING NEED TO UPDATE THE DIGITAL TERRAIN MODEL, SHOULD THERE BE ANY AMENDMENTS OR CHANGES TO THE DRAWINGS OR CONTRACT INITIATED BY THE CONTRACTOR.

FINISHED LEVELS PLAN NOTES:

- LEVELS DATUM IS A.H.D.
- ALL CONTOUR LINES & SPOT LEVELS INDICATE FINISHED PAVEMENT LEVELS U.N.O. ON PLAN.
- THE MAJOR CONTOUR INTERVAL IS 0.5m
- THE MINOR CONTOUR INTERVAL IS 0.1m.
- MINIMUM PAVEMENT GRADE IS TO BE 1:100 (1%).
- MAXIMUM PAVEMENT GRADE IS TO BE 1:20 (5%) IN CARPARKING AREAS AND 1:25 (4%) ELSEWHERE.
- MAXIMUM RAMP GRADES ARE TO BE 1:12 (8.3%) U.N.O. ON PLAN
- PROVIDE MINIMUM 3.0m LONG TRANSITION WHERE CHANGES GRADE EXCEED 1:20 (5%).
- PERMANENT BATTER SLOPES ARE TO HAVE A MAXIMUM GRADE OF 1V:3H.
- ALL BATTER SLOPE WITH GRADES AT OR EXCEEDING 1V:6H ARE TO BE TURFED IMMEDIATELY OR APPROPRIATE EROSION CONTROL IS TO BE PROVIDED TO THE SATISFACTION OF THE ENGINEER.
- ALL FOOTPATHS ARE TO FALL AWAY FROM THE BUILDING AT 2.5% NOMINAL GRADE.
- ALL PAVEMENTS ARE TO BE SET AT 50mm BELOW THE FINISHED FLOOR LEVEL OF THE WAREHOUSE AND OFFICE AREAS.

EROSION CONTROL NOTES

ALL CONTROL WORK INCLUDING DIVERSION BANKS AND CATCH DRAINS, V-DRAINS AND SILT FENCES SHALL BE COMPLETED DIRECTLY FOLLOWING THE COMPLETION OF THE EARTHWORKS.

- SILT FENCES AND SILT FENCE RETURNS SHALL BE ERECTED CONVEX TO THE CONTOUR TO POND WATER.
- HAY BALE BARRIERS AND GEOFABRIC FENCES ARE TO BE CONSTRUCTED TO TOE OF BATTER, PRIOR TO COMMENCEMENT OF EARTHWORKS, IMMEDIATELY AFTER CLEARING OF VEGETATION AND BEFORE REMOVAL OF TOP SOIL.
- ALL TEMPORARY EARTH BERMS, DIVERSION AND SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED AND MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
- CLEAR WATER IS TO BE DIVERTED AWAY FROM DISTURBED GROUND AND INTO THE DRAINAGE SYSTEM.
- THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROVIDING ON GOING ADJUSTMENT TO EROSION CONTROL MEASURES AS REQUIRED DURING CONSTRUCTION.
- ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING. TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE, APPROVED LOCATION.
- ALL FINAL EROSION PREVENTION MEASURES INCLUDING THE ESTABLISHMENT OF GRASSING ARE TO BE MAINTAINED UNTIL THE END OF THE DEFECTS LIABILITY PERIOD.
- ALL EARTHWORKS AREAS SHALL BE ROLLED ON A REGULAR BASIS TO SEAL THE EARTHWORKS.
- ALL FILL AREAS ARE TO BE LEFT WITH A BUND AT THE TOP OF THE SLOPE AT THE END OF EACH DAYS EARTHWORKS. THE HEIGHT OF THE BUND SHALL BE A MINIMUM OF 200MM.
- ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND HYDROMULCHED WITHIN 10 DAYS OF COMPLETION OF FORMATION.
- AFTER REVEGETATION OF THE SITE IS COMPLETE AND THE SITE IS STABLE IN THE OPINION OF A SUITABLY QUALIFIED PERSON ALL TEMPORARY WORK SUCH AS SILT FENCE, DIVERSION DRAINS ETC SHALL BE REMOVED.
- ALL TOPSOIL STOCKPILES ARE TO BE SUITABLY COVERED TO THE SATISFACTION OF THE SITE MANAGER TO PREVENT WIND AND WATER EROSION.
- ANY AREA THAT IS NOT APPROVED BY THE CONTRACT ADMINISTRATOR FOR CLEARING OR DISTURBANCE BY THE CONTRACTOR'S ACTIVITIES SHALL BE CLEARLY MARKED AND SIGN POSTED, FENCED OFF OR OTHERWISE APPROPRIATELY PROTECTED AGAINST ANY SUCH DISTURBANCE.
- ALL STOCKPILE SITES SHALL BE SITUATED IN AREAS APPROVED FOR SUCH USE BY THE SITE MANAGER. A 6m BUFFER ZONE SHALL EXIST BETWEEN STOCKPILE SITES AND ANY STREAM OR FLOW PATH. ALL STOCKPILES SHALL BE ADEQUATELY PROTECTED FROM EROSION AND CONTAMINATION OF THE SURROUNDING AREA BY USE OF THE MEASURES APPROVED IN THE EROSION AND SEDIMENTATION CONTROL PLAN.
- ACCESS AND EXIT AREAS SHALL INCLUDE SHAKE-DOWN OR OTHER METHODS APPROVED BY THE SITE MANAGER FOR THE REMOVAL OF SOIL MATERIALS FORM MOTOR VEHICLES.
- THE CONTRACTOR IS TO ENSURE RUNOFF FROM ALL AREAS WHERE THE NATURAL SURFACE IS DISTURBED BY CONSTRUCTION, INCLUDING ACCESS ROADS, DEPOT & STOCKPILE SITES, SHALL BE FREE OF POLLUTANTS BEFORE IT IS EITHER DISPERSED TO STABLE AREAS OR DIRECTED TO NATURAL WATERCOURSES.
- THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON ALL EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE AT ALL TIMES WATER SHALL NOT BE ALLOWED TO POND ON THE WORKS UNLESS SUCH PONDING IS PART OF AN APPROVED ESCP / SWMP.

SITE PREPARATION NOTES:

- ALL EARTHWORKS SHALL BE COMPLETED GENERALLY IN ACCORDANCE WITH THE GUIDELINES SPECIFIED BY PSM3312-0035 REV 0 DATED 11 MAY 2017
- EXISTING LEVELS ARE BASED ON INFORMATION PROVIDED BY REALSERVE SURVEYORS AND GEOMAT ENGINEERING PTY LTD.
- STRIP ANY TOP SOIL OR DELETERIOUS MATERIAL AND DISPOSE OF FROM SITE OR STORE AS DIRECTED.
- COMPLETE CUT TO FILL EARTHWORKS TO ACHIEVE THE REQUIRED LEVELS AS INDICATED ON THE DRAWINGS WITHIN A TOLERANCE OF +0mm/-10mm THROUGH BUILDING PADS/PAVEMENTS AND +0mm/-20mm ELSEWHERE.
- PREPARE STEEP BATTERS TO RECEIVE FILL BY CONSTRUCTING BENCHING TO FACILITATE FILL PLACEMENT AND COMPACTION.
- AREAS TO RECEIVE FILL (THAT ARE NOT ON BENCHMARKED BATTERS) AND AREAS IN CUT SHALL BE PROOF ROLLED TO IDENTIFY ANY SOFT HEAVING MATERIAL. SOFT MATERIAL SHALL BE BOXED OUT AND REMOVED PRIOR TO FILL PLACEMENT. PROOF ROLLING TO BE INSPECTED BY A GEOTECHNICAL ENGINEER OR THE EARTHWORKS DESIGNER.
- SITE WON FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HLF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HLF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
- IMPORTED FILL SHALL BE COMPACTED IN MAXIMUM 300mm LAYERS AND TO DRY OR HLF DENSITY RATIOS (STANDARD COMPACTION) OF BETWEEN 98% AND 103%. THE PLACEMENT MOISTURE VARIATION OR HLF MOISTURE VARIATION SHALL BE CONTROLLED TO BE BETWEEN 2% DRY AND 2% WET.
- ALL ENGINEERED FILL PARTICLES SHALL BE ABLE TO BE INCORPORATED WITHIN A SINGLE LAYER. FURTHER, LESS THAN 30% OF PARTICLES SHALL BE RETAINED ON THE 37.5 MM SIEVE. ENGINEERED FILL SHALL BE ABLE TO BE TESTED IN ACCORDANCE WITH THE STANDARD COMPACTION METHOD (AS1289.5.4.1) OR HLF TEST METHOD (AS1289.5.7.1). THESE METHODS REQUIRE LESS THAN 20% RETAINED ON THE 37.5 MM SIEVE. WHERE BETWEEN 20% AND 30% OF PARTICLES ARE RETAINED ON THE 37.5 MM SIEVE THE ABOVE TEST METHODS SHALL STILL BE ADOPTED AND TEST REPORTS ANNOTATED APPROPRIATELY. THESE REQUIREMENTS SHOULD BE MET BY THE MATERIAL AFTER PLACEMENT AND COMPACTION.
- ALL THE EARTHWORKS UNDERTAKEN AND THE SUBGRADE CONDITION IN THE CUT AREAS (IN THE STATED PERIOD) ARE DOCUMENTED IN THE REPORTS AND HAVE BEEN UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATION.
- PRIOR TO ANY EARTHWORKS, EROSION CONTROL AS OUTLINED IN THE EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE COMPLETED.
- EXISTING ROCK, IF ANY, SHALL BE REMOVED BY HEAVY ROCK BREAKING OR RIPPING.
- MATCH EXISTING LEVELS AT BATTER INTERFACE.
- CONTRACTOR TO MATCH EXISTING LEVELS AT THE INTERFACE OF EARTHWORKS AND EXISTING SURFACE AT BATTER LOCATIONS OR WHERE NO RETAINING WALLS ARE PRESENT. ANY DISCREPANCY BETWEEN DESIGN AND EXISTING LEVELS TO BE REFERRED TO THE ENGINEER FOR DIRECTION OR ADJUSTMENTS TO DESIGN LEVELS.

STORMWATER DRAINAGE NOTES:

- ALL STORMWATER WORKS TO BE COMPLETED IN ACCORDANCE WITH AUSTRALIAN STANDARD AS3500.3:2003 PLUMBING AND DRAINAGE, PART 3: STORMWATER DRAINAGE.
- THE MINOR (PIPED) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 20 YEAR ARI STORM EVENT AND THE MAJOR (OVERLAND) SYSTEM HAS BEEN DESIGNED FOR THE 1 IN 100 YEAR ARI STORM EVENT.
- ALL FINISHED PAVEMENT LEVELS SHALL BE AS INDICATED ON FINISHED LEVELS PLANS DA51 & DA52.
- PIT SIZES SHALL BE AS INDICATED IN THE SCHEDULE WHILE PIPE SIZES AND DETAILS ARE PROVIDED ON PLAN.
- EXISTING STORMWATER PIT LOCATIONS AND INVERT LEVELS TO BE CONFIRMED BY SURVEY PRIOR TO COMMENCING WORKS ON SITE.
- ALL STORMWATER PIPES Ø375 OR GREATER SHALL BE CLASS 2 REINFORCED CONCRETE WITH RUBBER RING JOINTS UNLESS NOTED OTHERWISE.
- ALL PIPES UP TO AND INCLUDING Ø300 TO BE uPVC GRADE SN8 UNO.
- PIPE CLASS NOMINATED ARE FOR IN-SERVICE LOADING CONDITIONS ONLY. CONTRACTOR IS TO MAKE ANY NECESSARY ADJUSTMENTS REQUIRED FOR CONSTRUCTION CONDITIONS.
- ALL CONCRETE PITS GREATER THAN 1000mm DEEP SHALL BE REINFORCED USING N12-200 EACH WAY CENTERED IN WALL AND BASE. LAP MINIMUM 300mm WHERE REQUIRED. ALL CONCRETE FOR PITS SHALL BE F'c 25 MPa. PRECAST PITS MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
- IN ADDITION TO ITEM 6 ABOVE, ALL CONCRETE PITS GREATER THAN 3000mm DEEP SHALL HAVE WALLS AND BASE THICKNESS INCREASED TO 200mm.
- PIPES SHALL BE LAID AS PER PIPE LAYING DETAILS. PARTICULAR CARE SHALL BE TAKEN TO ENSURE THAT THE PIPE IS FULLY AND EVENLY SUPPORTED. RAM AND PACK FILLING AROUND AND UNDER BACK OF PIPES AND PIPE FAUCETS, WITH NARROW EDGED RAMMERS OR OTHER SUITABLE TAMPING DETAILS.
- WHERE PIPE LINES ENTER PITS, PROVIDE 2m LENGTH OF STOCKING WRAPPED SLOTTED Ø100 uPVC TO EACH SIDE OF PIPE.
- ALL SUBSOIL DRAINAGE LINES SHALL BE Ø100 SLOTTED uPVC WITH APPROVED FILTER WRAP LAID IN 300mm WIDE GRANULAR FILTER UNLESS NOTED OTHERWISE. LAY SUBSOIL LINES TO MATCH FALLS OF LAND AND/OR 1 IN 200 MINIMUM. PROVIDE CAPPED CLEANING EYE (RODDING POINT) AT UPSTREAM END OF LINE AND AT 30m MAX. CTS. PROVIDE SUBSOIL LINES TO ALL PAVEMENT/ LANDSCAPED INTERFACES, TO REAR OF RETAINING WALLS (AS NOMINATED BY STRUCTURAL ENGINEER) AND AS SHOWN ON PLAN.
- ALL PIPE GRADES 1 IN 100 MINIMUM UNO.
- PROVIDE STEP IRONS IN PITS DEEPER THAN 1000mm.
- MIN. 600 COVER TO PIPE ØBVERT BENEATH ROADS & MIN. 400 COVER BENEATH LANDSCAPED AND PEDESTRIAN AREAS.
- PIT COVERS IN TRAFFICABLE PAVEMENT SHALL BE CLASS D 'HEAVY DUTY', THOSE IN CONTAINER PAVEMENT SHALL BE CLASS G 'HEAVY DUTY', AND THOSE LOCATED IN NON-TRAFFICABLE AREAS SHALL BE CLASS B 'MEDIUM DUTY' UNO.
- PROVIDE CLEANING EYES (RODDING POINTS) TO PIPES AT ALL CORNERS AND T-JUNCTIONS WHERE NO PITS ARE PRESENT.
- DOWN PIPES (DP) TO BE AS PER HYDRAULIC ENGINEERS DETAILS WITH CONNECTOR TO MATCH DP SIZE U.N.O. ON PLAN. PROVIDE CLEANING EYE AT GROUND LEVEL.
- PIPE LENGTHS NOMINATED ON PLAN OR LONGSECTIONS ARE MEASURED FROM CENTER OF PITS TO THE NEAREST 0.5m AND DO NOT REPRESENT ACTUAL LENGTH. THE CONTRACTOR IS TO ALLOW FOR THIS.



FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION 16.09.19 C				ARCHITECT MICHAEL CARR ARCHITECT 88 TOPE STREET SOUTH MELBOURNE VIC 3205 PH: (03) 9645 5635				CLIENT BUNNINGS warehouse				PROJECT BUNNINGS WAREHOUSE LOT 3, BRINGELLY ROAD HORNINGSEA PARK, NSW				Costin Roe Consulting Pty Ltd. Consulting Engineers Level 1, 8 Macdonell Street Wahbi Bay, Sydney NSW 2000 Tel: (02) 9551-7889 Fax: (02) 9541-3721 email: mail@costinroe.com.au ©				PRECISION COMMUNICATION ACCOUNTABILITY				DRAWING TITLE DRAWING LIST & GENERAL NOTES			
ISSUED FOR DEVELOPMENT APPLICATION 13.09.19 B																											
ISSUED FOR INFORMATION 04.09.19 A																											
AMENDMENTS				AMENDMENTS				AMENDMENTS				AMENDMENTS				DRAWING NO C011994.06-DA10				ISSUE C							

LEGEND:
PROVIDE 1m RETURNS TO SILT FENCE AT 30m MAX. INTERVALS.
TYPICAL (N.S.O.P.)

- SILT FENCE ONLY
- SILT FENCE WITH CATCH DRAIN
- DIVERSION DRAIN
- OVERLAND FLOW PATH

SEDIMENTATION BASIN NOTE:

FOR SEDIMENT & EROSION CONTROL DETAILS REFER TO DRAWING C011994.06-DA25.
SEDIMENTATION BASIN SIZING BASED ON RECOMMENDATIONS OF 'SOILS AND CONSTRUCTION, MANAGING URBAN STORMWATER-THE BLUE BOOK'.
CAPACITY BASED UPON 5 DAY RAINFALL DEPTH AT 85th PERCENTILE INTENSITY (24.4mm).

APPROXIMATE AREA OF DISTURBED SITE = 4.4ha

SEDIMENT BASIN 1:
CATCHMENT AREA = 4.097ha
REQUIRED BASIN VOLUME = 750m³
BASE DIMENSIONS (L X W) = 14m x 23.0m
TOP DIMENSIONS (L X W) = 23.0m x 32.0m
MAX SIDE SLOPE = 1V:3H
DEPTH = 1.5m
PROVIDED BASIN VOLUME = 772m³

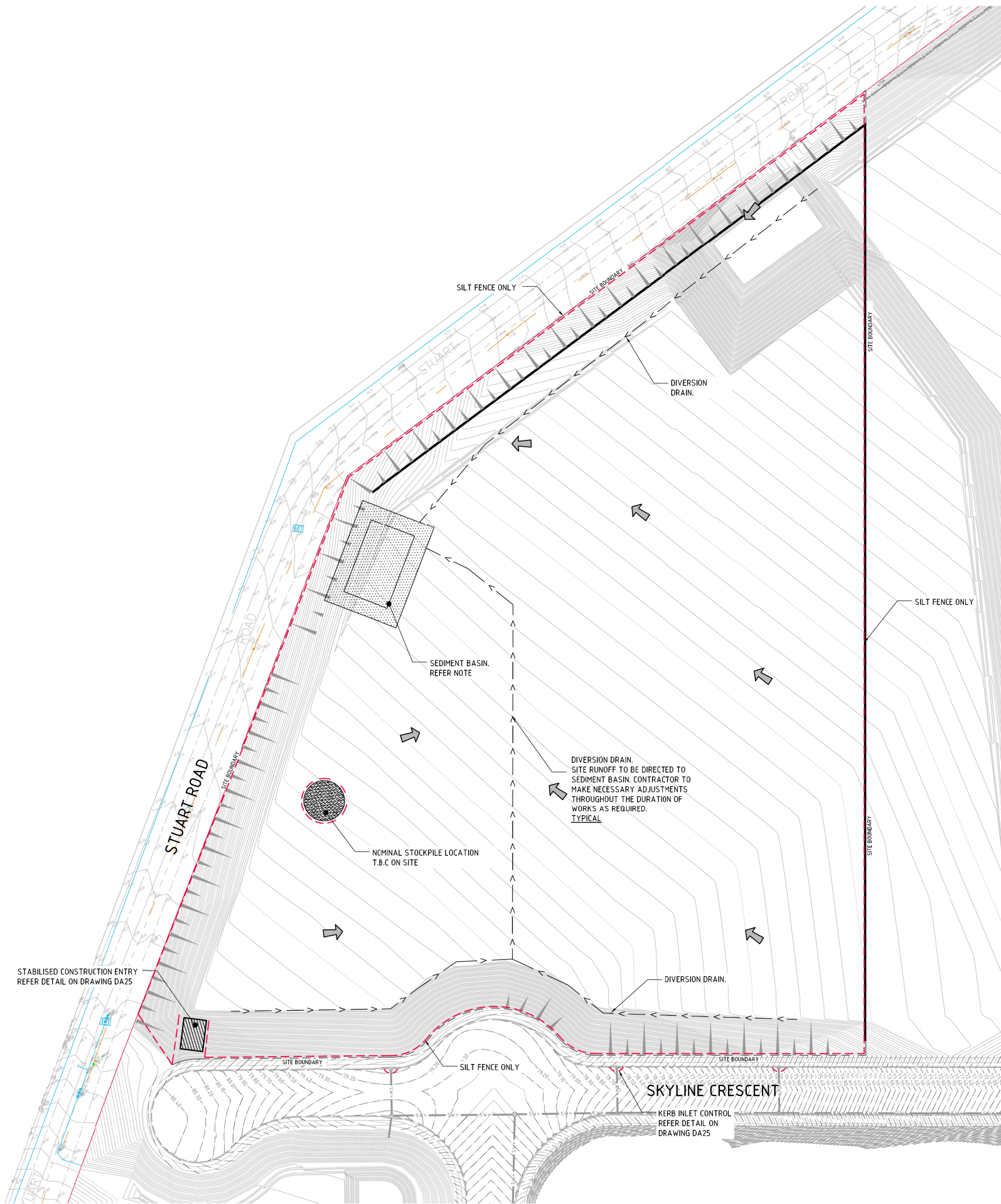
SEDIMENTATION BASINS TO COLLECT RUN-OFF IN EXTREME RAINFALL EVENTS.
COLLECTED RUN-OFF TO BE ASSESSED BY A QUALIFIED LABORATORY FOR DOUSING RATES OF ALUM OR GYPSUM TO ENSURE COAGULATION OF SEDIMENTS PRIOR TO WATER BEING DISCHARGED TO COUNCIL STORMWATER SYSTEM.

EACH BASIN IS TO HAVE A MARKER PLACED AS PER THE DETAIL TO INDICATE WHEN SEDIMENT IS TO BE REMOVED. REMOVED SEDIMENT IS TO BE CLASSED AND DEWATERED PRIOR TO REMOVAL FROM SITE.

ALLOWANCE TO BE MADE DURING BENCHING OF SITE TO ENSURE RUN-OFF IS DIRECTED TO SEDIMENTATION BASINS.

NOTES:

1. ASSUME TYPE D SOIL (CLAY/SILTY CLAY)
2. ASSUME GROUP D SOIL (HIGH PLASTICITY AND SHRINK/SWELL PROPERTIES)



EROSION & SEDIMENT CONTROL PLAN
SCALE 1:500

FOR DEVELOPMENT APPLICATION

5m 0 10 20 30 40 50m
SCALE 1:500 AT A0 SIZE SHEET

ISSUED FOR DEVELOPMENT APPLICATION	16.09.19	C
ISSUED FOR DEVELOPMENT APPLICATION	13.09.19	B
ISSUED FOR INFORMATION	04.09.19	A
AMENDMENTS	DATE	ISSUE

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AMENDMENTS	DATE	ISSUE
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CLIENT
BUNNINGS warehouse

PROJECT
BUNNINGS WAREHOUSE
LOT 3, BRINGELLY ROAD
HORNINGSSEA PARK, NSW

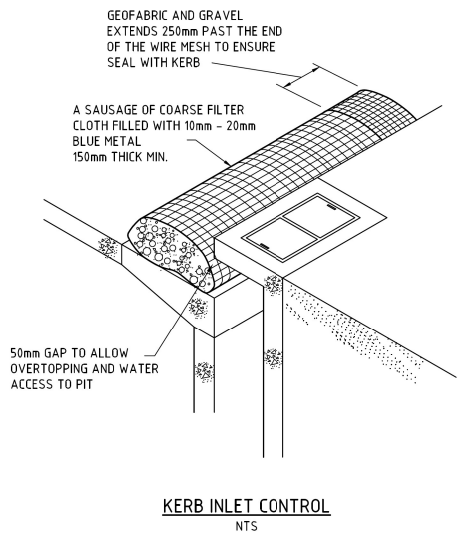


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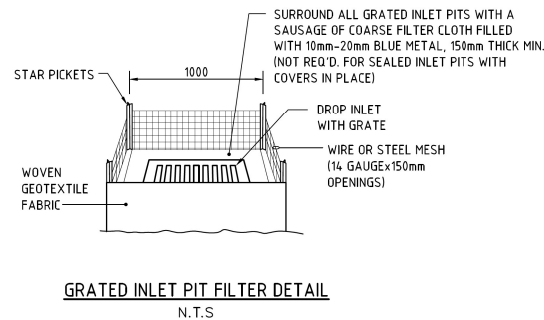
Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
EROSION & SEDIMENT CONTROL PLAN
DRAWING No C011994.06-DA20
ISSUE C

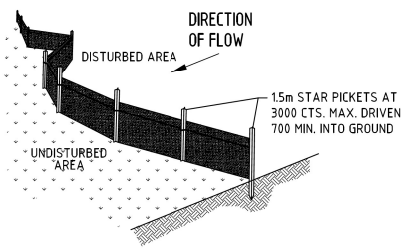


Kerb Inlet Control
N.T.S.

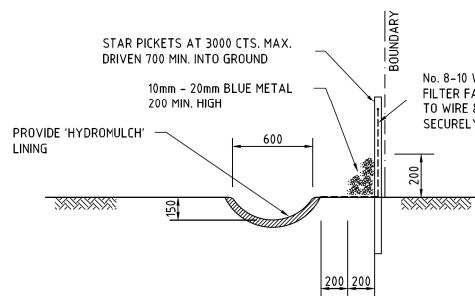


Grated Inlet Pit Filter Detail
N.T.S.

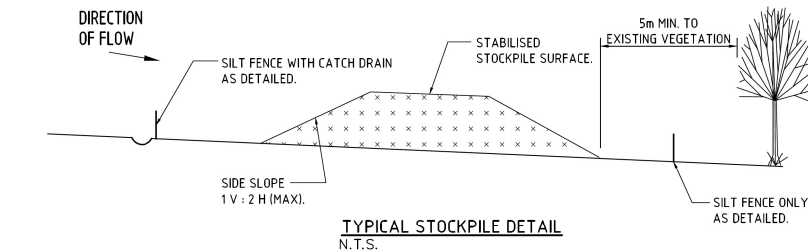
NOTE: ADOPT ABOVE DETAILS AROUND ALL PITS WITHIN AREA ENCOMPASSED BY SILT FENCE & TO PITS ON THE ROAD ADJACENT TO SITE BOUNDARY.



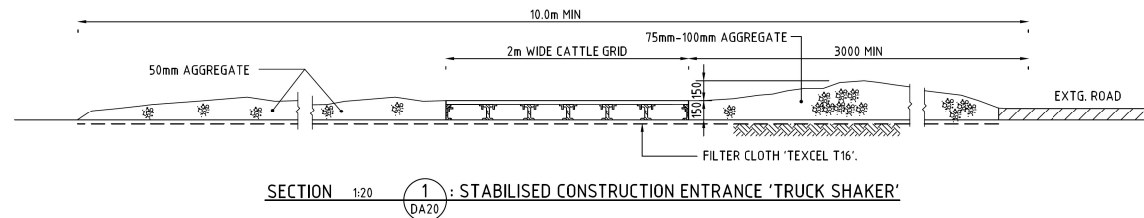
Typical Silt Fence Detail
N.T.S.
PROVIDE 1m RETURNS AT 30m INTERVALS.
TYPICAL



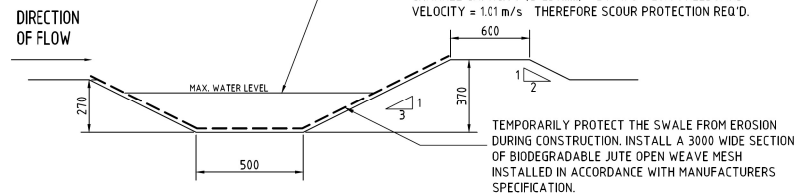
Typical Open Drain & Silt Fence
SCALE 1:20



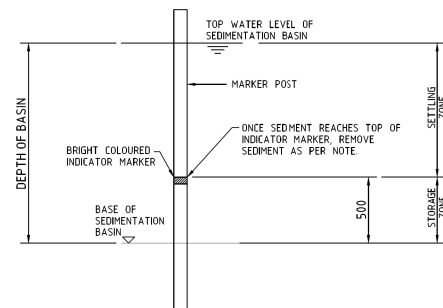
STOCKPILE NOTES
1. PLACE ALL STOCKPILES IN LOCATIONS MORE THAN 5m FROM EXISTING VEGETATION, ROADS & HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT ELONGATED MOUNDS. SIDE SLOPE TO BE 1 V: 2 H MAX.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE STOCKPILES ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE USING WOOD CHIP MULCH - 16 TONNE/Ha.
5. CONSTRUCT SILT FENCE WITH CATCH DRAIN ON UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES & SILT FENCE ONLY 1 TO 2m DOWNSLOPE AS SHOWN.



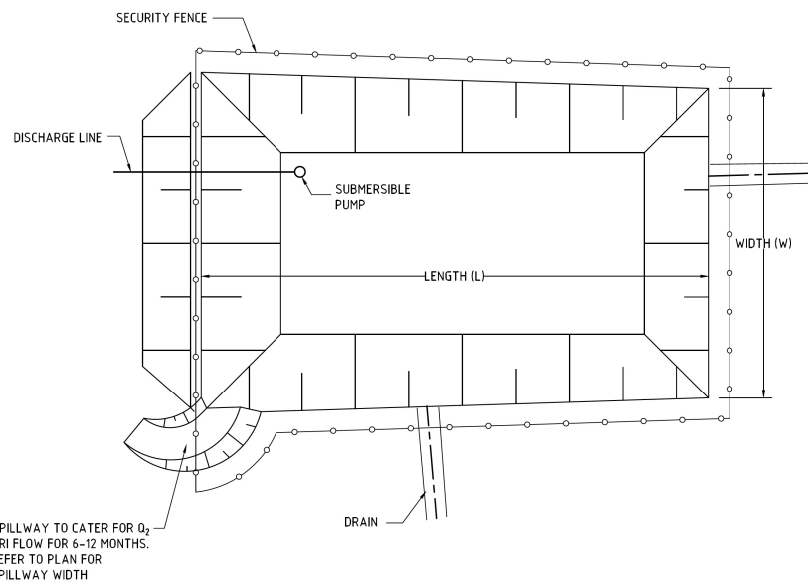
DIVERSION CHANNEL CAPACITY
 $Q_2 = 230 \text{ l/s}$ ($A=2.22\text{Ha}$ MAX.)
MANNINGS $n=0.02$, MIN. SLOPE = 0.5%
CHANNEL CAPACITY ($d=250\text{mm}$) = $240 \text{ l/s} + 20\%$ FREEBOARD
VELOCITY = 1.01 m/s THEREFORE SCOUR PROTECTION REQ'D.



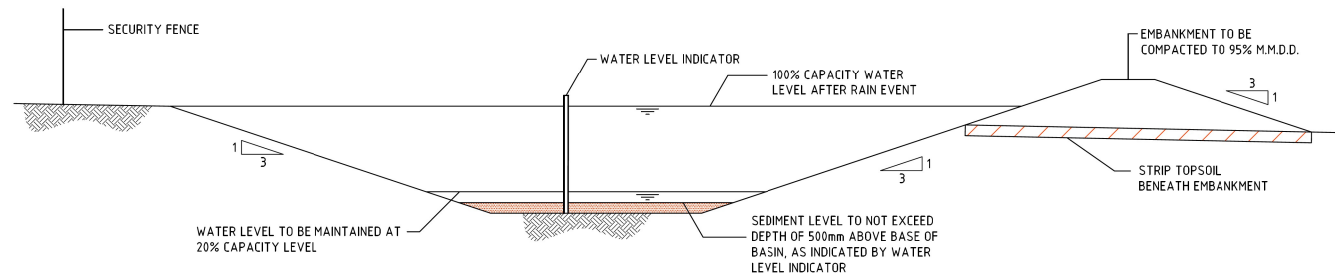
Diversion Drain Section
SCALE 1:20



Sediment Storage Marker
SCALE 1:20

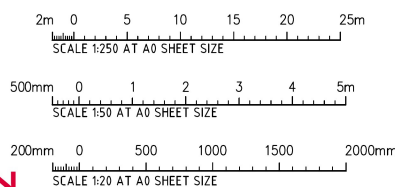


Typical Sediment Control Pond Plan
SCALE 1:250



Typical Sediment Control Basin Section
SCALE 1:50

NOTES:
ALL EROSION & SEDIMENT CONTROL MEASURES TO BE INSPECTED & MAINTAINED DAILY BY SITE MANAGER.
MINIMISE DISTURBED AREAS.
ROADS & FOOTPATHS TO BE SWEEPED DAILY.
12m TURF TO BE PLACED BEHIND KERBS.
DUST MINIMISATION CONTROL BY WATERING TO BE IMPLEMENTED BY SITE MANAGER AS REQUIRED OR AS DIRECTED BY THE EPA.



LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY SY0734/09.001 BY LAND PARTNERS SURVEYORS 14/11/17 AND COSTIN ROE CONSULTING ESTATE DESIGN LEVELS.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- EXISTING ESTATE DRAINAGE LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- SYPHONIC DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- EXISTING ESTATE CONTOUR

FOR CONTINUATION REFER DRAWING DA42 (SHEET 2)

PROPOSED BUILDING
FFL 76.00 ± 500mm

ROOFWATER TO BE CONVEYED
VIA INTERNAL SYPHONIC
DRAINAGE BY OTHERS

ROOFWATER TO BE CONVEYED
VIA EXTERNAL SYPHONIC
DRAINAGE BY OTHERS

PROVIDE BREAK IN ISLAND FOR
RUNOFF TO PIT. TYPICAL

PROVIDE BREAK IN ISLAND FOR
RUNOFF TO PIT WHERE PIT
SHOWN IN ISLAND. TYPICAL

35KL NURSERY IRRIGATION STORAGE TANK.
PROVIDE 375Ø OVERFLOW TO PIT A19 &
FIRST FLUSH DIVERter TO DETAIL DESIGN

PROVIDE LOCAL FALL AT 1% TO
DRAINAGE IN OUTDOOR AREA

MAX 7.4m HIGH RETAINING WALL
AS PART OF ESTATE WORKS ON
EASTERN BOUNDARY

STORMWATER DRAINAGE NOTES:
REFER TO DRAWING C011994.06-DA10 FOR STORMWATER
DRAINAGE NOTES

LEVELS NOTE:

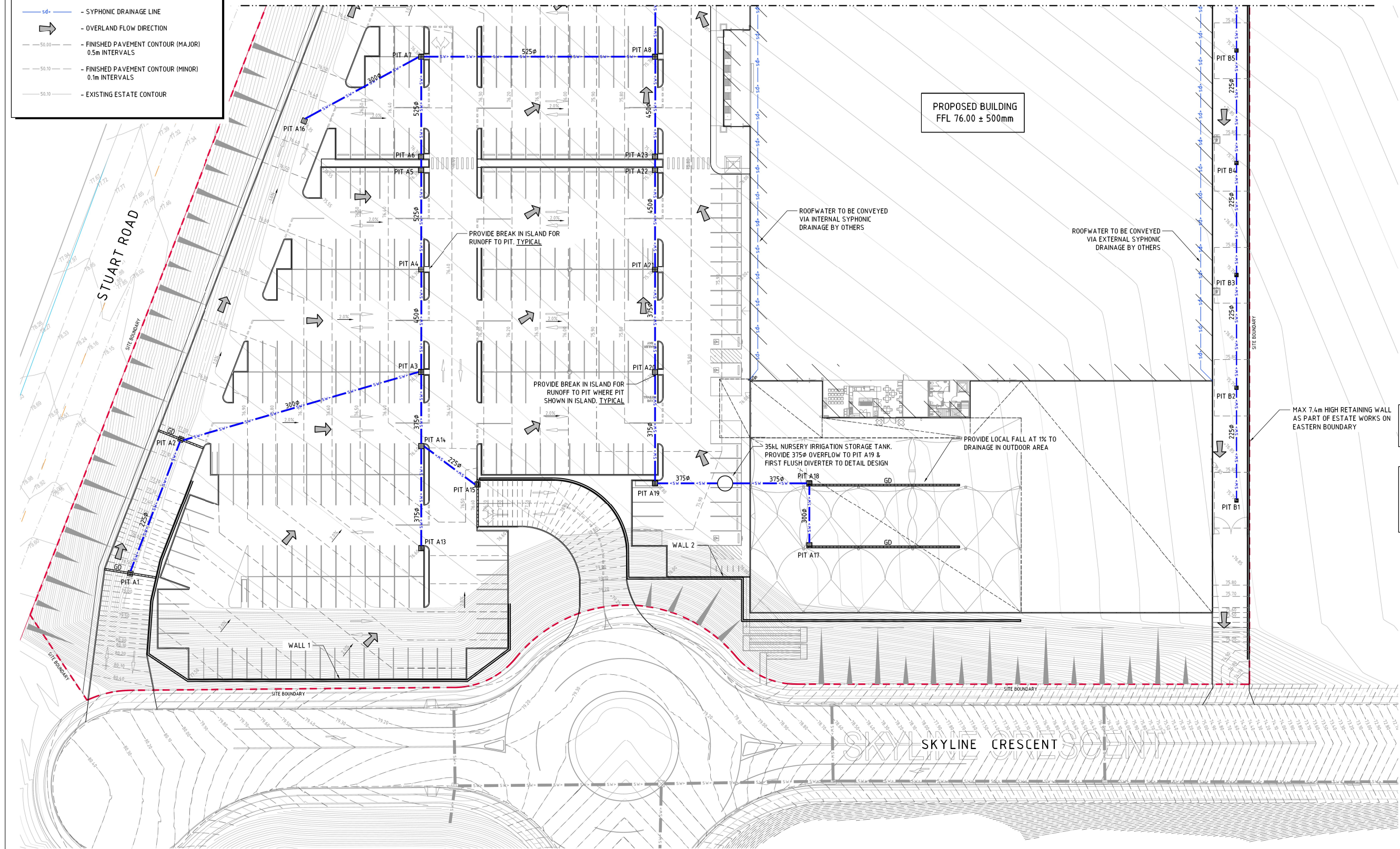
LEVELS SHOWN TO BE ± 500mm FROM THOSE SHOWN. FINAL
LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS.
ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL
EARTHWORKS BALANCE OVER THE PROPERTY.

PIT SCHEDULE - A

PIT No.	GRATE RL	TYPE	SIZE	COMMENT
PIT A1	78.60	S.G.G.P.	900x900	
PIT A2	77.03	S.G.G.P.	900x900	
PIT A3	76.30	S.G.G.P.	900x900	
PIT A4	76.30	S.G.G.P.	900x900	
PIT A5	76.30	S.G.G.P.	900x900	
PIT A6	76.30	S.G.G.P.	900x900	
PIT A7	76.30	S.G.G.P.	900x900	
PIT A8	75.70	S.G.G.P.	900x900	
PIT A9	75.70	S.G.G.P.	900x900	
PIT A10	75.70	S.G.G.P.	900x900	
PIT A11	75.77	S.J.P.	900x900	
PIT A12	75.78	S.J.P.	1200x1200	
PIT A13	76.60	S.G.G.P.	900x900	
PIT A14	76.40	S.G.G.P.	900x900	
PIT A15	76.60	S.G.G.P.	900x900	
PIT A16	76.35	S.G.G.P.	900x900	
PIT A17	75.90	S.G.G.P.	900x900	
PIT A18	75.90	S.G.G.P.	900x900	
PIT A19	75.80	S.G.G.P.	900x900	
PIT A20	75.70	S.G.G.P.	900x900	
PIT A21	75.70	S.G.G.P.	900x900	
PIT A22	75.70	S.G.G.P.	900x900	
PIT A23	75.70	S.G.G.P.	900x900	

PIT SCHEDULE - B & C

PIT No.	GRATE RL	TYPE	SIZE	COMMENT
PIT B1	75.75	S.G.G.P.	900x900	
PIT B2	75.75	S.G.G.P.	900x900	
PIT B3	75.75	S.G.G.P.	900x900	
PIT B4	75.75	S.G.G.P.	900x900	
PIT B5	75.75	S.G.G.P.	900x900	
PIT B6	75.75	S.G.G.P.	900x900	
PIT B7	75.75	S.G.G.P.	900x900	
PIT B8	75.96	S.G.G.P.	900x900	
PIT B9	75.80	S.G.G.P.	900x900	
PIT B10	75.80	S.G.G.P.	900x900	
PIT B11	75.60	S.J.P.	900x900	
PIT B12	75.35	S.G.G.P.	900x900	
PIT B13	75.48	S.J.P.	900x900	
PIT B14	75.73	S.G.G.P.	900x900	
PIT B15	75.75	S.G.G.P.	900x900	
PIT B16	75.75	S.G.G.P.	900x900	
PIT B17	75.70	S.G.G.P.	900x900	
PIT C1	75.72	S.G.G.P.	900x900	
PIT C2	73.90	S.G.G.P.	900x900	
PIT C3	71.90	S.G.G.P.	900x900	
PIT C4	69.50	S.G.G.P.	900x900	
PIT C5	67.20	S.G.G.P.	900x900	



STORMWATER DRAINAGE PLAN - SHEET 1
SCALE 1:250

FOR DEVELOPMENT APPLICATION

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SIZE SHEET

ISSUED FOR DEVELOPMENT APPLICATION	04.11.19	F
REVISED AS CLOUDED	30.10.19	E
ISSUED FOR DEVELOPMENT APPLICATION	16.09.19	D
ISSUED FOR DEVELOPMENT APPLICATION	13.09.19	C
ISSUED FOR INFORMATION	04.09.19	B
ISSUED FOR INFORMATION	23.08.19	A

AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

ARCHITECT
MICHAEL CARR ARCHITECT
88 TOPE STREET
SOUTH MELBOURNE VIC 3205
PH: (03) 9645 5635

CLIENT
BUNNINGS
warehouse

PROJECT
BUNNINGS WAREHOUSE
LOT 3, BRINGELLY ROAD
HORNINGSEA PARK, NSW



Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahbi Bay, Sydney NSW 2000
Tel: (02) 8254-7889 Fax: (02) 8244-3721
email: mail@costinroe.com.au ©

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
STORMWATER DRAINAGE PLAN
SHEET 1

DRAWING No C011994.06-DA41

ISSUE
F

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY SY073409.001 BY LAND PARTNERS SURVEYORS 14/11/17 AND COSTIN ROE CONSULTING ESTATE DESIGN LEVELS.

- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- PROPOSED DRAINAGE LINE
- EXISTING ESTATE DRAINAGE LINE
- ROOFWATER DOWNPIPE (INDICATIVE)
- SYPHONIC DRAINAGE LINE
- OVERLAND FLOW DIRECTION
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- EXISTING ESTATE CONTOUR

PIT SCHEDULE:

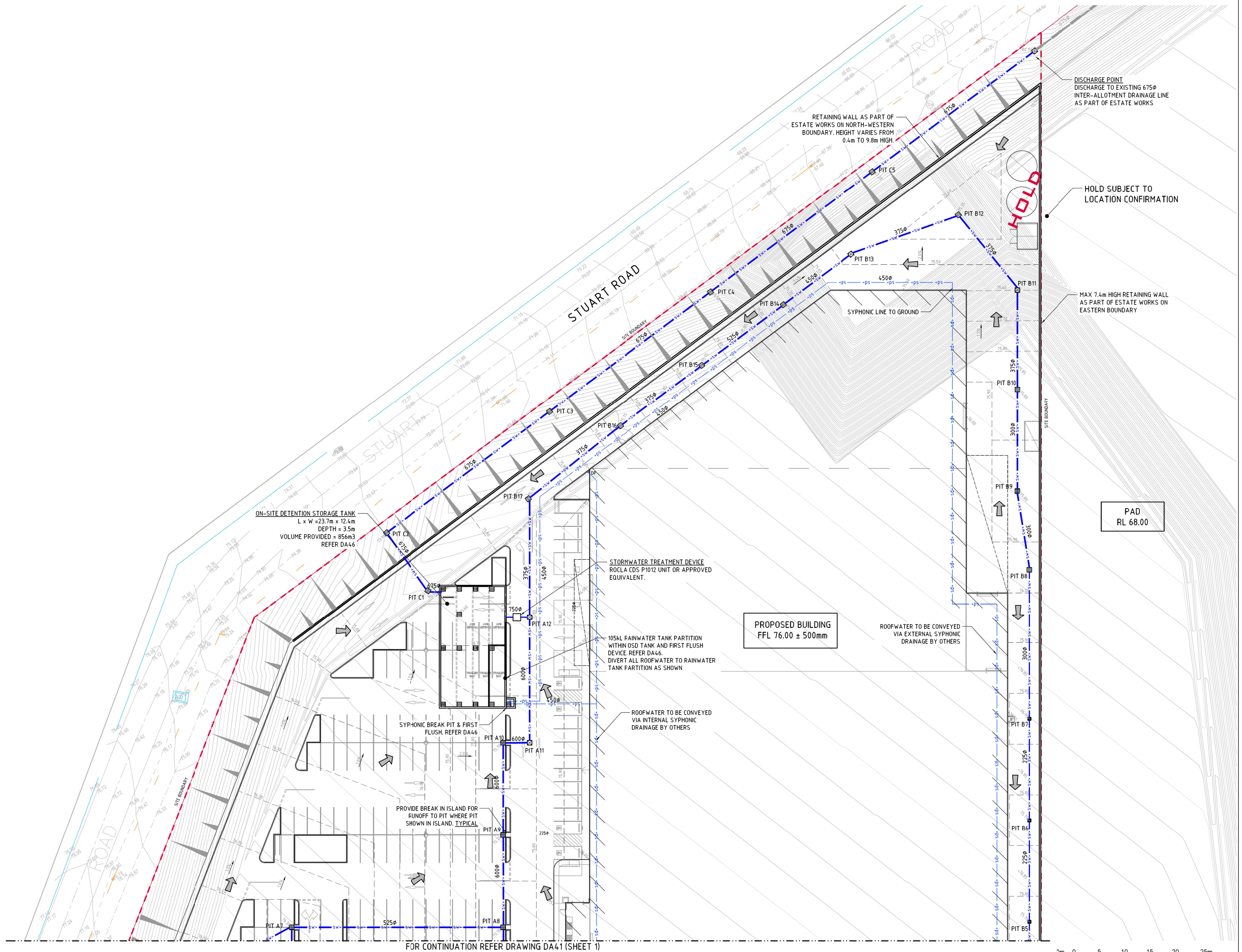
REFER TO DRAWING DA41 FOR PIT SCHEDULE.

STORMWATER DRAINAGE NOTES:

REFER TO DRAWING C011994.06-DA10 FOR STORMWATER DRAINAGE NOTES

LEVELS NOTE:

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.



FOR CONTINUATION REFER DRAWING DA41 (SHEET 1)

STORMWATER DRAINAGE PLAN - SHEET 2
SCALE 1:250

FOR DEVELOPMENT APPLICATION

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SIZE SHEET

ISSUED FOR DEVELOPMENT APPLICATION	04.11.19	F
REVISED AS CLOUDED	30.10.19	E
ISSUED FOR DEVELOPMENT APPLICATION	16.09.19	D
ISSUED FOR DEVELOPMENT APPLICATION	13.09.19	C
ISSUED FOR INFORMATION	04.09.19	B
ISSUED FOR INFORMATION	23.08.19	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE
------------	------	-------	------------	------	-------

ARCHITECT
MICHAEL CARR ARCHITECT
88 TOPE STREET
SOUTH MELBOURNE VIC 3205
PH: (03) 9645 5635

CLIENT
BUNNINGS
warehouse

PROJECT
BUNNINGS WAREHOUSE
LOT 3, BRINGELLY ROAD
HORNINGSSEA PARK, NSW

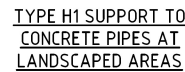
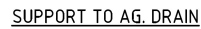
CONSULTANT
COSTIN ROE CONSULTING

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Wahbi Bay, Sydney NSW 2000
Tel: (02) 8554-7889 Fax: (02) 8544-3721
email: mail@costinroe.com.au

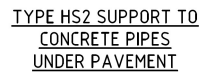
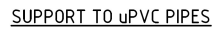
Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE
STORMWATER DRAINAGE PLAN
SHEET 2
DRAWING No C011994.06-DA42
ISSUE F

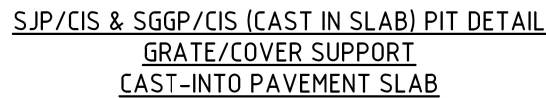


PIPE LAYING DETAILS



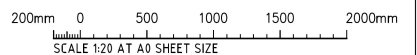
D ≤ 1350, MAX FILL = 4.0m
D > 1350, MAX FILL = 3.0m

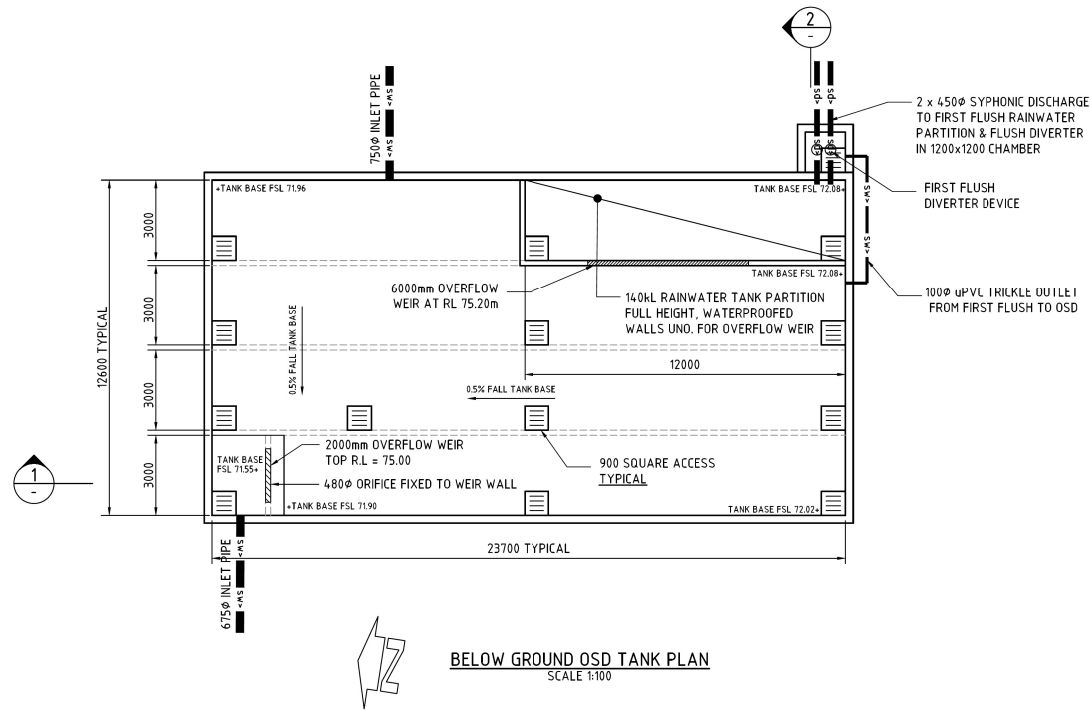
REFER TO ENGINEER FOR TRENCH
WIDTHS FOR PIPE SIZES GREATER
THAN 1800Ø



SJP/CIS & SGGP/CIS (CAST IN SLAB) PIT DETAIL
GRATE/COVER SUPPORT
CAST-INTO PAVEMENT SLAB

FOR DEVELOPMENT APPLICATION

[illegible]

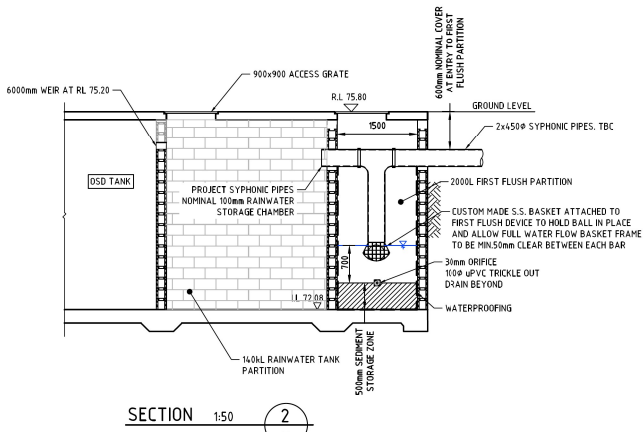
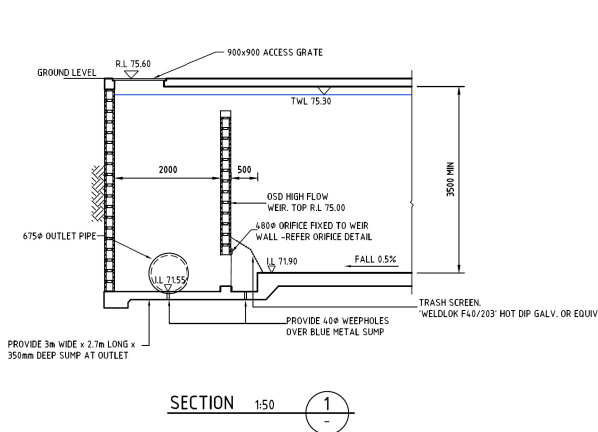
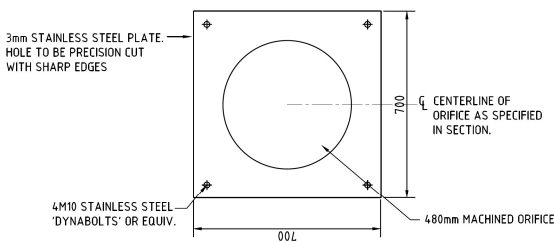


OSD TANK DETAILS

SITE AREA	
TOTAL SITE AREA	40 910m ²
TOTAL SITE AREA DRAINING TO STORAGE (90% IMPERVIOUS)	39 000m ²
STORAGE	
ORIFICE Ø	480mm
VOLUME PROVIDED	855m ³
INTERNAL TANK DIMENSIONS (INC. HIGH FLOW CHAMBERS)	23.7m x 12.0m

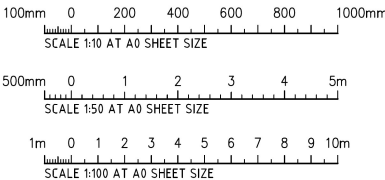
OSD HYDRAULIC DETAILS

STORM A.R.I EVENT	STORM DURATION	PRE-DEVELOPMENT FLOW (m3/s)	POST-DEVELOPMENT FLOW (UN-ATTENUATED) (m3/s)	POST-DEVELOPMENT FLOW (ATTENUATED) (m3/s)	OSD TANK WATER DEPTH (mm)	OSD TANK STORAGE VOLUME (m3)
5 YEAR	1 HOUR	0.849	1.09	0.699	1950	470
20 YEAR	2 HOURS	1.39	1.57	0.827	2830	680
100 YEAR	2 HOURS	1.81	2.10	1.49	3400	820



NOTE:

STRUCTURAL DESIGN OF TANK BY STRUCTURAL ENGINEER IN DETAIL DESIGN STAGE.



FOR DEVELOPMENT APPLICATION

ISSUED FOR DEVELOPMENT APPLICATION	16.09.19	C	ARCHITECT	MICHAEL CARR ARCHITECT	CLIENT	BUNNINGS warehouse	PROJECT	BUNNINGS WAREHOUSE	COSTIN ROE CONSULTING PTY LTD.	DRAWING TITLE	STORMWATER DRAINAGE DETAILS
ISSUED FOR DEVELOPMENT APPLICATION	13.09.19	B	88 TOPE STREET	88 TOPE STREET	LOT 3, BRINGELLY ROAD	LOT 3, BRINGELLY ROAD	Level 1, 9 Windmill Street	Level 1, 9 Windmill Street	Wahbi Bay, Sydney NSW 2000	SHEET 2	SHEET 2
ISSUED FOR INFORMATION	04.09.19	A	SOUTH MELBOURNE VIC 3205	SOUTH MELBOURNE VIC 3205	HORNINGSEA PARK, NSW	HORNINGSEA PARK, NSW	Tel: (02) 8254-7889 Fax: (02) 8244-3721	Tel: (02) 8254-7889 Fax: (02) 8244-3721	email: mail@costinroe.com.au	PRECISION COMMUNICATION ACCOUNTABILITY	PRECISION COMMUNICATION ACCOUNTABILITY
AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE

LEVELS DATUM IS AHD.

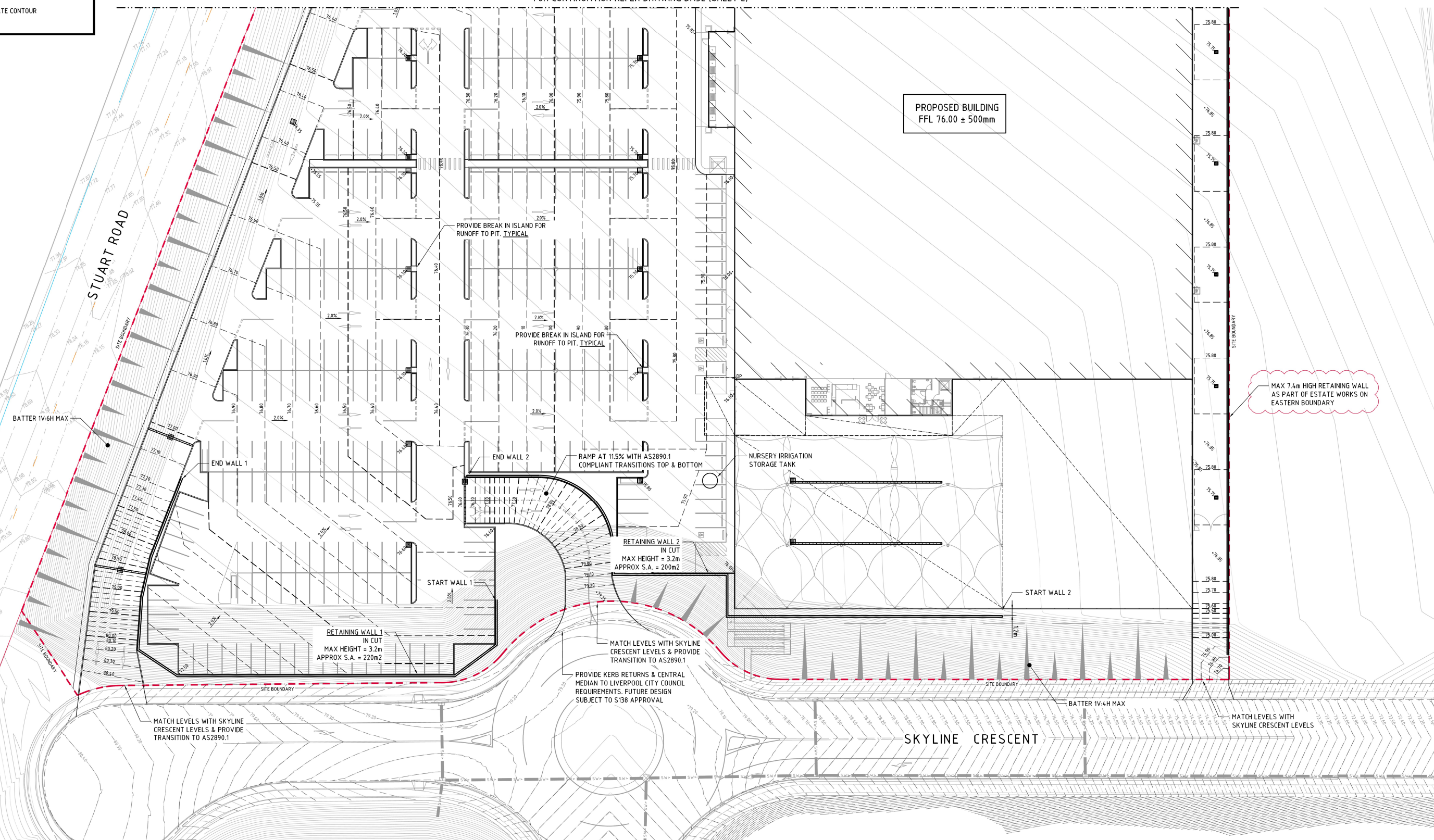
EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF
SURVEY SY073409.001 BY LAND PARTNERS SURVEYORS 14/11/17
AND COSTIN ROE CONSULTING ESTATE DESIGN LEVELS.

- | | |
|---|---|
|  | - SGGP, SINGLE GRATED GULLY PIT |
|  | - SJP, SEALED JUNCTION PIT |
|  | - GD, GRATED DRAIN (300w x 225D UNO) |
|  | - FINISHED PAVEMENT CONTOUR (MAJOR)
0.5m INTERVALS |
|  | - FINISHED PAVEMENT CONTOUR (MINOR)
0.1m INTERVALS |
|  | - EXISTING ESTATE CONTOUR |

REFER TO DRAWING C013730.00-DA10 FOR FINISHED LEVEL NOTES

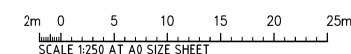
LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.

FOR CONTINUATION REFER DRAWING DA52 (SHEET 2)



FINISHED LEVELS PLAN - SHEET 1
SCALE 1:250

FOR DEVELOPMENT APPLICATION

[illegible]

LEGEND:

LEVELS DATUM IS AHD.

EXISTING SITE LEVELS AND DETAILS BASED ON A PLAN OF SURVEY SY0734/09.001 BY LAND PARTNERS SURVEYORS 14/11/17 AND COSTIN ROE CONSULTING ESTATE DESIGN LEVELS.

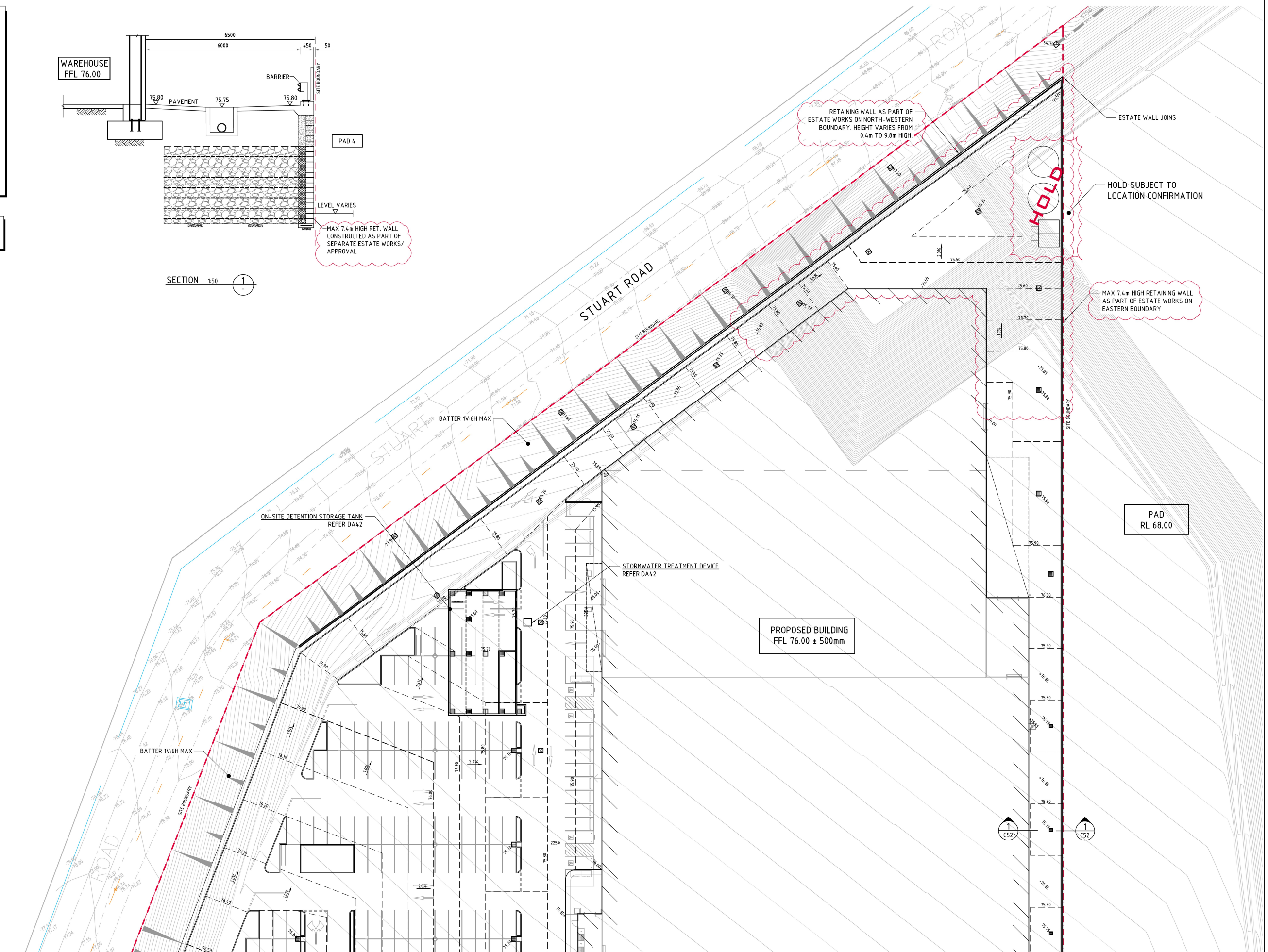
- SGGP, SINGLE GRATED GULLY PIT
- SJP, SEALED JUNCTION PIT
- GD, GRATED DRAIN (300W x 225D UNO)
- FINISHED PAVEMENT CONTOUR (MAJOR) 0.5m INTERVALS
- FINISHED PAVEMENT CONTOUR (MINOR) 0.1m INTERVALS
- EXISTING ESTATE CONTOUR

FINISHED LEVEL NOTES:

REFER TO DRAWING C013730.00-DA10 FOR FINISHED LEVEL NOTES

LEVELS NOTE:

LEVELS SHOWN TO BE +/-500mm FROM THOSE SHOWN. FINAL LEVELS SUBJECT TO FINAL GEOTECHNICAL INVESTIGATIONS, ARCHITECTURAL LAYOUT AND ACHIEVING A CUT TO FILL EARTHWORKS BALANCE OVER THE PROPERTY.



FOR CONTINUATION REFER DRAWING DA51 (SHEET 1)

FINISHED LEVELS PLAN - SHEET 2
SCALE 1:250

FOR DEVELOPMENT APPLICATION

2m 0 5 10 15 20 25m
SCALE 1:250 AT A0 SIZE SHEET

REVISED AS CLOUDED	30.10.19	F
ISSUED FOR DEVELOPMENT APPLICATION	16.09.19	E
REVISED AS CLOUDED	13.09.19	D
ISSUED FOR DEVELOPMENT APPLICATION	13.09.19	C
ISSUED FOR INFORMATION	04.09.19	B
ISSUED FOR INFORMATION	23.08.19	A
AMENDMENTS	DATE	ISSUE

AMENDMENTS	DATE	ISSUE	AMENDMENTS	DATE	ISSUE
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ARCHITECT
MICHAEL CARR ARCHITECT
88 TOPE STREET
SOUTH MELBOURNE VIC 3205
PH: (03) 9645 5635

CLIENT
BUNNINGS
warehouse

PROJECT
BUNNINGS WAREHOUSE
LOT 3, BRINGELLY ROAD
HORNINGSSEA PARK, NSW



COSTIN ROE CONSULTING PTY LTD.
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Level 1, 8 Windmill Street
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email: mail@costinroe.com.au

Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

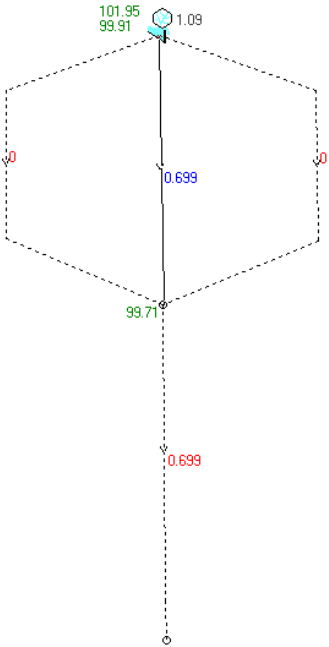
DRAWING TITLE
FINISHED LEVELS PLAN
SHEET 2

DRAWING No C011994.06-DA52

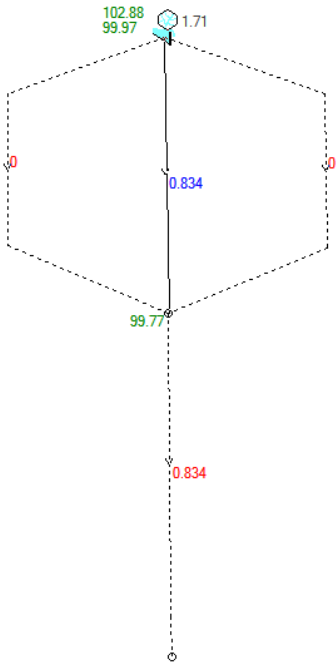
ISSUE
F

Appendix B

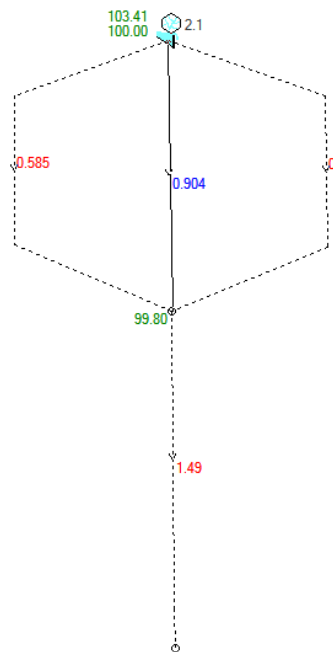
DRAINS MODEL



Q5 MODEL



Q20 MODEL



Q100 MODEL

Appendix C

SEARS 10366 (Dated 30 Aug. 2019)

Planning Secretary's Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*

Application Number	SSD 10366
Project Name	Bunnings Warehouse, Leppington
Development	Construction and operation of a large format retail building for hardware and building supplies and garden centre (Bunnings Warehouse), encompassing a warehouse, covered outdoor nursery, bagged goods store, timber trade sales area, café, office, amenities, car parking and landscaping within the Bringelly Road Business Hub
Location	Lot 3 within Bringelly Road Business Hub located at Bringelly Road, Horningsea Park (Lot 11 DP 29104), Liverpool local government area
Applicant	Bunnings Group Limited
Date of Issue	30/08/2019
General Requirements	The Environmental Impact Statement (EIS) must be prepared in accordance with, and meet the minimum requirements of clauses 6 and 7 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> (the Regulation). In addition, the EIS must include: - a detailed description of the development, including: · a description of the proposed operation · the need and justification for the proposed development · likely staging of the development · likely interactions between the development and any existing, approved and proposed developments in the vicinity of the site · plans of any proposed works with details of the proposed setbacks, site coverage, car parking, landscaped areas · details of infrastructure upgrades or items required to facilitate the development, and a description of any arrangements to ensure the upgrades will be implemented in a timely manner and maintained. - a detailed description of how the development is consistent with the Bringelly Road Business Hub concept approval (SSD 6324), particularly the approved land uses - consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments - a list of any approvals that must be obtained under the <i>Local Government Act 1993</i>, the <i>Roads Act 1993</i>, or any other Act or law before the development may lawfully be carried out - consideration of key issues identified by Government agencies and Liverpool City Council (see Attachment 2) - a risk assessment of any potential environmental impacts of the development, identifying the issues for further assessment Where relevant, the assessment of key issues below, and any other significant

	issues identified in the risk assessment, must include: - adequate baseline data - consideration of the potential cumulative impacts due to other developments in the vicinity (completed, underway or proposed); - measures to avoid, minimise and if necessary, offset predicted impacts, including detailed contingency plans for managing any significant risks to the environment; and - a health impact assessment of local and regional impacts associated with the development, including those health risks associated with relevant key issues. The EIS must also be accompanied by a report from a qualified quantity surveyor providing: - a detailed calculation of the Capital Investment Value (CIV) (as defined in clause 3 of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived. The report shall be prepared on company letterhead and indicate applicable GST component of the CIV; - an estimate of jobs that will be created during the construction and operational phases of the proposed development; and - certification that the information provided is accurate at the date of preparation.
Key issues	The EIS must include an assessment of potential impacts of the proposal (including cumulative impacts) and develop appropriate measures to avoid, mitigate, manage and/or offset these impacts. The EIS must address the following specific matters: 1. Statutory and Strategic Context - o demonstrate that the proposal is consistent with all relevant planning strategies, environmental planning instruments, adopted precinct plans, draft district plan(s) and adopted management plans and justification for any inconsistencies. The following documents must be addressed: - o <i>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development</i> - o <i>State Environmental Planning Policy No. 64 – Advertising and Signage</i> - o <i>State Environmental Planning Policy (Infrastructure) 2007</i> - o <i>State Environmental Planning Policy (State and Regional Development) 2011</i> - o <i>State Environmental Planning Policy (Western Sydney Parklands) 2009</i> - o <i>Liverpool Local Environmental Plan 2008</i> - o <i>Parklands Plan of Management 2030.</i> - o address the matters to be included in future development applications, as described in Part B of the development consent SSD 6324. 2. Community and Stakeholder Engagement – including: - o a detailed community and stakeholder engagement strategy identifying who and how stakeholders will be engaged in the process - o a report detailing the issues raised and how they have been addressed

including any changes to the proposal

- o details of proposed engagement activities throughout the construction and operation of the development.

3. Social and Economic – including:

- o identifying and analysing the potential social impacts of the development from the point of view of the affected community and other relevant stakeholders
- o assessment of the significance of positive, negative and cumulative social impacts
- o mitigation measures and monitoring of likely negative social impacts
- o an analysis of potential economic impacts of the development, including a discussion of any potential economic benefits.

4. Traffic and Access – including:

- o a quantitative Traffic Impact Assessment prepared in accordance with the relevant Council, Austroads and RMS guidelines
- o details of all daily and peak traffic and transport movements likely to be generated by the development (vehicle type, public transport) during construction and indicative operation
- o details and a justification of access to, from and within the site (vehicular and pedestrian)
- o impacts on the safety and capacity of the surrounding road network (including intersections along Bringelly Road and Cowpasture Road) and access points, using SIDRA modelling or similar to assess impacts from current traffic counts and cumulative traffic from existing and proposed development
- o demonstrate that sufficient loading/unloading, car parking and pedestrian and cyclist facilities have been provided for the development
- o details of road upgrades, new roads or access points required for the development, if necessary.

5. Noise and Vibration – including:

- o a quantitative noise and vibration impact assessment undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority (EPA) guidelines and including an assessment of nearby sensitive receivers
- o cumulative impacts of other developments
- o details of proposed mitigation, management and monitoring measures.

6. Urban Design

Measures to minimise the visual impacts of the development, including:

- o a detailed assessment of the proposed development including height, colour, scale, building materials and finishes, signage and lighting, particularly from nearby residential receivers
- o detailed plans showing suitable landscaping
- o justification for any inconsistencies with the Updated Site Design Guidelines prepared by JBA Urban Planning Consultants, dated June 2015 as amended and approved under Condition A9 of the development consent for SSD 6324

- o include details of any advertising signage or structures proposed as part of the development.

7. Bushfire

Prepare a bushfire assessment report which provides an assessment of bushfire hazard, including:

- o details of the storage of flammable materials
- o an assessment against the requirements of *Planning for Bushfire Protection 2006*, particularly access and provision of water supply for firefighting purposes
- o a description of measures to ensure the proposal will not increase the bushfire risk to adjoining lands.

8. Soil and Water – including:

- o a description of water demands of the development and a breakdown of water supplies
- o identify any water licensing requirements under the *Water Act 1912* or *Water Management Act 2000*
- o details of proposed erosion and sediment controls during construction
- o detailed plans and a description of the surface and stormwater management system, including on-site detention, designed in accordance with Water Sensitive Urban Design principles
- o an assessment of potential flooding impacts
an assessment of potential impacts (including from potential spillage of materials) on surface and groundwater resources, drainage patterns, soil (stability, salinity and acid sulfate soils), related infrastructure, watercourses and riparian land and proposed mitigation measures.

9. Hazards and Risks – including:

- o a preliminary risk screening completed in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33* (DoP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. Should preliminary screening indicate that the project is “potentially hazardous” a preliminary hazard analysis (PHA) must be prepared in accordance with *Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis* (DoP, 2011) and *Multi-Level Risk Assessment* (DoP, 2011)
- o report on consultation with pipeline operator Jemena to ensure that any nearby high pressure gas pipelines remain compliant with the relevant Australian Standards throughout the life of the development and include a Safety Management Study, if necessary.

10. Biodiversity – including:

- o details of the number of trees to be removed and the number of trees to be planted on the site
- o an assessment and documentation of biodiversity impacts related to the development in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR) in the form required by section 6.12 of the *Biodiversity Conservation Act 2016*, clause 6.8 of the *Biodiversity Conservation Regulation 2017* and the

	Biodiversity Assessment Method. 11. Heritage – including: - o consideration of heritage items within the vicinity of the site and any potential heritage impacts associated with the development. 12. Waste Management – including: - o details of the quantities and classification of all waste streams to be generated on site in accordance with the EPA's Waste Classification Guidelines (2014) - o details of waste storage, handling, transport, and disposal - o the measures that would be implemented to ensure the development is consistent with the aims, objectives and guidelines in the <i>NSW Waste Avoidance and Resource Recovery Strategy 2014-21</i>. 13. Air Quality – including: - o a description of all air quality impacts (including dust) from the proposal, particularly from the outdoor storage area - o details of dust control during site preparation and civil works. 14. Ecologically Sustainable Development and Energy Efficiency – including: - o an assessment of how the development will incorporate ecologically sustainable development principles in all phases of the development - o consideration of the use of green walls, green roof and/or cool roof into the design - o climate change projections developed for the Sydney Metropolitan area and how they are used to inform the building design and asset life of the project - o an assessment of the energy uses on-site, and demonstrate the measures proposed to ensure the development is energy efficient.
Plans and Documents	The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Regulation. Provide these as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: - Liverpool City Council - Western Sydney Parklands Trust - Roads and Maritime Services - Transport for New South Wales - Environment, Energy and Science of DPIE - Sydney Water - Water NSW - Rural Fire Service

	- Jemena - surrounding landowners and the local community - any other public transport or community service providers. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge a Development Application and EIS for the development within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this proposal.

ATTACHMENT 1

Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:

<http://www.planning.nsw.gov.au>

<http://www.epa.nsw.gov.au>

<http://www.environment.nsw.gov.au>

<http://www.dpi.nsw.gov.au>

Plans and Documents

The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*. Provide these as part of the EIS rather than as separate documents.

In addition, the EIS must include the following:

1. An existing site survey plan drawn at an appropriate scale illustrating:
 - the location of the land, boundary measurements, area (sq.m) and north point
 - the existing levels of the land in relation to buildings and roads
 - location and height of existing structures on the site
 - location and height of adjacent buildings and private open space
 - all levels to be to Australian Height Datum (AHD).
2. A locality/context plan drawn at an appropriate scale indicating:
 - significant local features
 - the location and uses of existing buildings, shopping and employment areas
 - traffic and road patterns, pedestrian routes and public transport nodes.
3. Drawings at an appropriate scale illustrating:
 - draft plan of subdivision prepared by a registered surveyor
 - detailed earthworks plan
 - stormwater concept plan
 - landscape plan
 - Construction Management Plan, inclusive of a Construction Traffic Management Plan and construction methodology and staging.

Documents to be Submitted

Documents to submit include:

- 1 hard copy and 1 electronic copy of all the documents and plans for review prior to exhibition
- Additional copies as determined by the Department once the development application is lodged

Policies, Guidelines and Plans	
Aspect	Policy /Methodology
Social	
	Social Impact Assessment Guideline (Department of Planning and Environment)
Traffic and Access	
	Roads Act 1993
	Austrroads Guide to Traffic Management – Part 12: Traffic Impacts of Development
	Planning Guidelines for Walking and Cycling
	Guide to Traffic Generating Development (RTA)
	Cycling Aspects of Austrroads Guides
	Road Design Guide (RTA)
	NSW 2021
	NSW Long Term Transport Master Plan
	Sydney's Walking Future
	Sydney's Cycling Future
Noise and Vibration	
	Interim Construction Noise Guideline (DECC)
	Assessing Vibration: a technical guide (DEC)
	NSW Noise Policy for Industry 2017 (EPA)
	Environmental Criteria for Road Traffic Noise (EPA)
	Noise Guide for Local Government (EPA)
Bushfire	
	Planning for Bush Fire Protection 2006 (RFS)
	Draft Planning for Bush Fire Protection 2018 (RFS)
Soil and Water	
Surface Water	National Water Quality Management Strategy: Water quality management - an outline of the policies (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Policies and principles - a reference document (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Implementation guidelines (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)

Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)

State Water Management Outcomes Plan

Water Guidelines for Controlled Activities (DPI)

NSW Government Water Quality and River Flow Environmental Objectives (DECC)

Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)

Managing Urban Stormwater: Soils & Construction (Landcom)

Managing Urban Stormwater: Treatment Techniques (DECC)

Managing Urban Stormwater: Source Control (DECC)

Technical Guidelines: Bunding & Spill Management (DECC)

Policies, Guidelines and Plans	
Aspect	Policy /Methodology
	Floodplain Development Manual (DIPNR)
	Floodplain Risk Management Guideline (DECC)
	A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)
	Technical Guidelines: Bunding & Spill Management (DECC)
	Council's Stormwater Management Policy 2017
<i>Erosion and Sediment</i>	Managing Urban Stormwater: Soils & Construction (Landcom)
	Design Manual for Soil Conservation Works - Technical Handbook No. 5 (Soil Conservation Service of NSW)
	Soil and Landscape Issues in Environmental Impact Assessment (DLWC)
	Wind Erosion – 2nd Edition
<i>Groundwater</i>	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	NSW State Groundwater Policy Framework Document (DLWC)
	NSW State Groundwater Quality Protection Policy (DLWC)
	NSW State Groundwater Quantity Management Policy (DLWC) Draft
	The NSW State Groundwater Dependent Ecosystem Policy (DLWC)
	Guidelines for the Assessment and Management of Groundwater Contamination (DECC) Draft
	NSW Aquifer Interference Policy (NOW)
<i>Soil</i>	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC & NHMRC)
	National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC)
	State Environmental Planning Policy No. 55 – Remediation of Land
	Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land (DOP)
Hazards and Risk	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard

Analysis

Biodiversity
NSW Biodiversity Assessment Method (OEH, 2017)
The NSW State Groundwater Dependant Ecosystem Policy (DLWC)
Heritage
<i>Heritage Act 1977</i>
Waste
Waste Avoidance and Resource Recovery Strategy 2014-2021 (EPA 2014)
EPA's Waste Classification Guidelines
Environmental Guidelines: Assessment Classification and Management of Non-Liquid and Liquid Waste (NSW EPA)
Air Quality
Protection of the Environment Operations (Clean Air) Regulation 2002
Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)

ATTACHMENT 2

Government Authority Responses to Request for Key Issues
For Information Only